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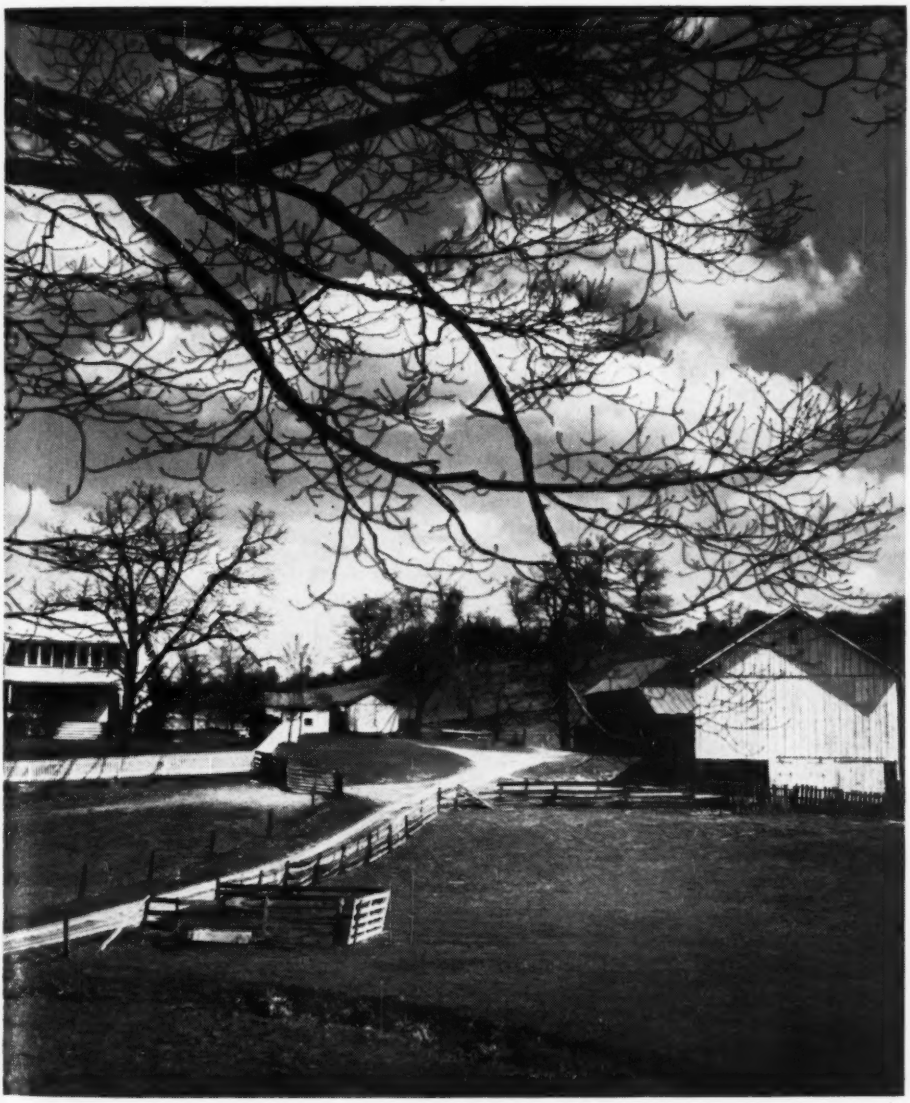

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R. H. STINCHFIELD, *Editor*

Editorial Office: 1155 16th Street, N. W., Washington 6, D. C.

VOLUME XXXI NO. 2

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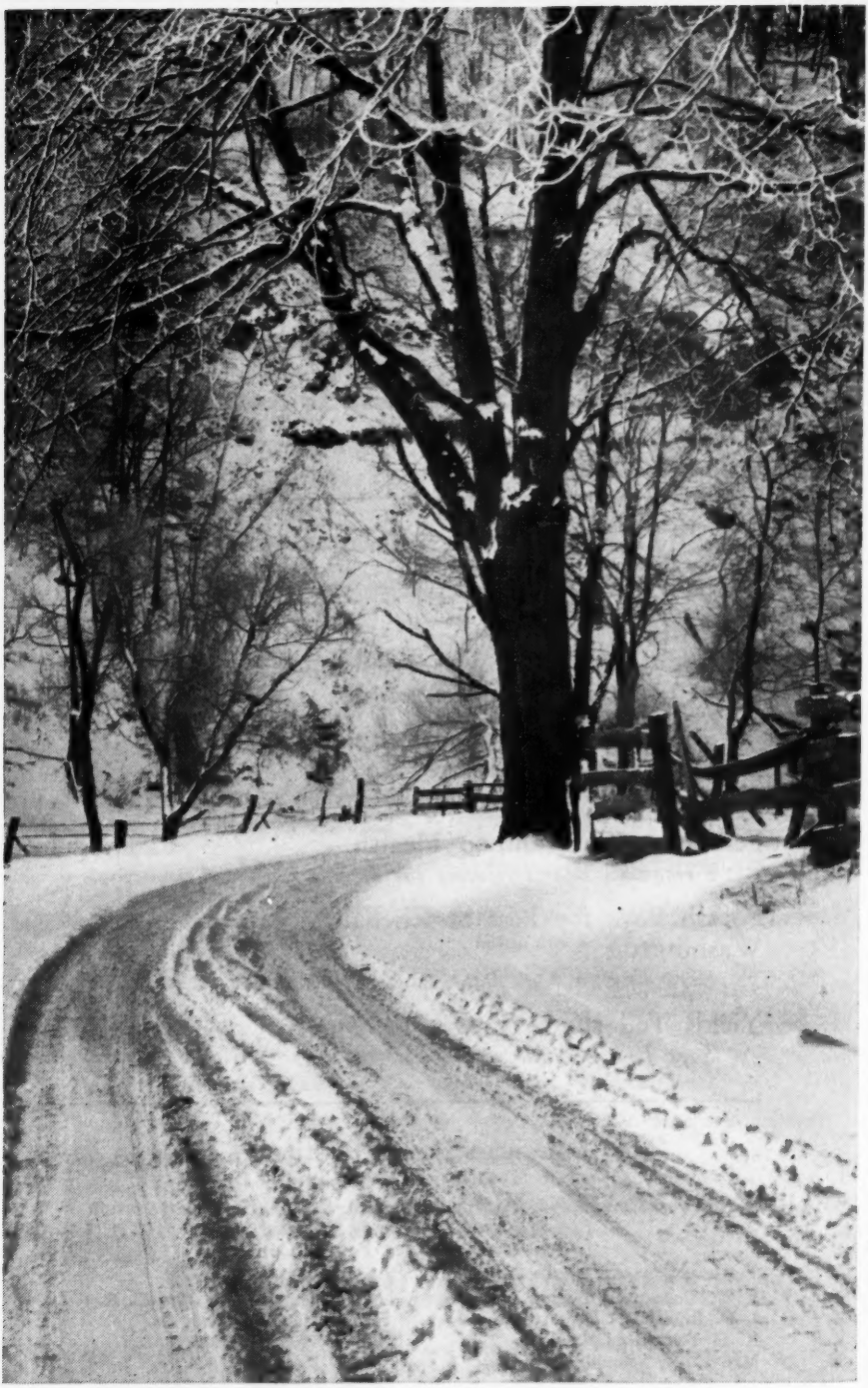

A FEBRUARY LANDSCAPE

Better Crops with PLANT FOOD

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VOL. XXXI WASHINGTON, D. C., FEBRUARY 1947 No. 2

Presenting a . . .

Home Town of Heroes

Jeff McDermid

"HOME town boy makes good" is a common prideful boast of many Main Street newspapers in America, yet if you care to consider the case of Alexandria, Virginia, some interesting points develop. For Alexandria has the oldest daily newspaper in the country, the venerable Gazette dating to pre-revolutionary times, and its scribes can point with inky insouciance to several famous national heroes of the present, as well as to the wealth of history, romance, and rumor which testify to the success of two outstanding "home town boys"—George Washington and Robert Edward Lee. Likewise General "Tooey" Spaatz of Air Force fame resides there, albeit he is merely a Yankee importation.

This being the traditional Washington month, one need spend but a bit of space to General Lee in his relations to this ancient town. Situated on Oronoco Street opposite the present much-publicized home of doughty "Jawn" L. Lewis is No. 607. Here in 1818 Mrs. General Henry (Light Horse) Harry Lee, then a widow, brought her son Robert to live. He roamed the adjacent wild acreage north of town, then known as the Prince George Meadows, and attended Alexandria Academy which is still standing. In the next house lived a Quaker teacher, Benjamin Hallowell, to whose kind tutelage Mrs. Lee consigned her son in preparation for his entrance to West Point.

Their neighbors across Oronoco Street were the Philip Fendalls. The first Mrs. Fendall was the mother-in-law of the aforesaid Light Horse Harry Lee, while the second Mrs. Fendall

was Mary Lee, sister to the same cavalry general of the Revolution. Later on this mansion was bought by one of the numerous Lee family and occupied by them for years. It was here that the citizens of the town met to plan their part in Washington's funeral.

Today it has become the domicile of the coal mine boss himself. Possibly few of its residents have exerted as much personal power. Its interior is shrouded in mystery and kept tightly shuttered from the public gaze, but Mr. Lewis sometimes likes to entertain and show visitors his period furniture and antiques.

ALONG this quiet side street passed the cavalcade in honor of Marquis Lafayette, who paid a respectful visit to General Harry Lee during his memorable visit to the town in 1825. Two blocks south is the Lloyd mansion built in 1793 wherein General Lee got first news of his appointment as leader of the Confederate forces in Virginia, while visiting there after Sunday services at Christ church, then the parish meeting house for Arlington where he resided.

There is still a second dwelling in Alexandria that was for awhile the home of the most famous Lees. It is on Cameron Street a block south of the one just noted. Here Light Horse Harry's family lived just before his death. He was Governor of Virginia in 1794 and was the one who created the tribute to Washington: First in war, first in peace, and first in the hearts of his countrymen.

One other venerated spot is associated with Robert E. Lee. It is Leadbeater's drug store, retaining all its old original trappings and medicine jars. It was a favorite gossiping spot for the town worthies. Here in October, 1859, a message came to General Lee from General "Jeb" Stuart, then a Colonel, requiring his aid in the quick settlement of a disturbing fracas near Harper's Ferry caused by a hot-headed old fanatic from up in the Maryland hills.

Of course the links are close between the two favorite sons of Alexandria because General Lee married Mary Custis, daughter of Washington's adopted son, George Washington Parke Custis —and we now swing back into the trail which befits this month especially.

In July, 1749, George Washington at the age of 17 received his surveyor's commission, and one of his first jobs was to lay out the streets in Alexandria. He had previously served apprenticeship in civil engineering of the day with George William Fairfax, with whom he had made excursions out over the rugged wilds along the King's Highway westward—the same trail that Governor Dinwiddie took and on which Braddock marched to meet defeat, and which still later became the pathway for the weary "foot cavalry" of Stonewall Jackson.

Originally Alexandria was known as Bellhaven, where a company of Scotch merchants from Glasgow built a big tobacco shipping warehouse. In 1748 the town was incorporated by Thomas Lord Fairfax, John Carlyle, William Ramsay, and Lawrence Washington, half-brother of the General. It was a gallant age of pomp and splendor for the rich planters and merchants of the province.

Mary Washington, then a widow, was living at her farm home on the Rappahannock near Fredericksburg, while the oldest brother, son of Augustine Washington and his first wife, resided at the ancestral homestead of Mt. Vernon. Naturally, George stuck with his own mother who was Augustine's second wife. He thus had two half-brothers, Lawrence and Augustine, Jr., and his full brothers and one sister were named John Augustine, Charles, Samuel, and Elizabeth.

WHILE the gentry of means in northern Virginia were prosperous, George and his folks were poor. Mary Washington was too proud to ask for financial help and George was keen to ply his rod and chain along

the Shenandoah Valley and forego the blandishments of society. Poor crops and too many dependent slaves impoverished the dwindling fortunes of George and his mother's branch of the family, so that the fees he earned from Alexandria assignments and other road-building jobs came as a welcome fund during the years before the General reached his majority.

At the age of 21 history notes that George Washington accepted a commission from Governor Dinwiddie to inquire into the numbers and objec-

tives of a French force on the Ohio, and he equipped himself with the journey's necessities at Alexandria. After two months' absence he returned to Williamsburg to file his official report, which aroused the people of Virginia to their menacing dangers.

By this time George had indeed become a freeholder in the parish of Alexandria, as his deceased brother Lawrence had willed Mt. Vernon to him. Meanwhile General Edward Braddock had set sail for Virginia and finally landed at the port of Alexandria with two regiments who sailed past the wooded promontory of Washington's Potomac farm enroute to their rendezvous with the colonists. Robert Orme, the English aide-de-camp, asked Washington to join the proposed campaign against the French and Indians.

Moving to Alexandria to be near the scene of preparations, the young patriot took quarters at Gadsby's Tavern and helped drill raw recruits to serve with the Redcoats on their trek into the wilds. It seems interesting as one visits this old hostelry on the corner to realize how so much of the General's biggest exploits and social diversions took place within its crumbling walls. The fatal outcome of that stubbornly and foolishly planned expedition by Braddock, impervious to pioneer warnings, is too well-known to be repeated except to point out that Washington, although ill with fever and bearing bullet holes in his coat, managed to guide the routed soldiers back to their starting place—Carlyle House on the Potomac, now a shrine of faded grandeur. Later he returned to finish off the French on almost the same battleground in 1758. The next year he married Martha Dandridge Custis, widow of Colonel Dan Parke Custis, and began the only interval of rural life and agricultural security he experienced until that brief period after his retirement from high posts of public duty.

While Washington was not a profoundly religious man, he served as vestryman for at least two churches, the Truro parish and church at Pohick, seven miles west of Mt. Vernon, and for a short time the Fairfax parish. Vestries were chosen by the freeholders and they performed the duties of civil officers and assisted the courts in certain secular affairs.

The General was on the building committee and helped draw the plans and personally bossed the building of the Pohick church and accepted the estimates and arranged the contract for building of the Falls church, located at Falls Church eight miles from Alexandria. He also served on the building committee for the famous Christ church in Alexandria, all three structures having much the same exterior style of Georgian architecture.

(*Turn to page* 49)

Fig. 1. Corn taken from plots which had stands of 4,000, 9,000, and 12,000 plants per acre in an experiment on Bladen very fine sandy loam, J. V. Taylor farm, Pitt County. The yields were 53, 82, and 93 bushels per acre, respectively. All plots received 20-80-80 at planting and 180 lbs. of nitrogen side-dressing.

Research Points the Way For Higher Corn Yields In North Carolina[1]

By B. A. Krantz[2]

Agricultural Experiment Station, Raleigh, North Carolina

RECENT research findings in corn fertilization, breeding, and culture indicate great potentialities for increasing North Carolina's corn yield. A hybrid corn-breeding program, initiated about 10 years ago and greatly expanded some eight years ago by Dr. Paul H. Harvey, has already produced several adapted hybrids. In 1944 an intensive research program in corn fertilization and culture was started. Fortunately, there were several well-adapted hybrids available for use in these experiments. Thus we were able to combine our efforts in fertility research with those of the corn breeder and make the most of the yield capability of these new hybrids.

Neglected

Little progress has been made in increasing corn yields during the past 30 years in North Carolina. Table 1 shows

[1] North Carolina Agricultural Experiment Station and the Division of Soils, Fertilizers and Irrigation; Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. D. A. cooperating.

[2] Associate Soil Scientist, Division of Soils, Fertilizers, and Irrigation, U. S. D. A.

that the corn yield during 1936-40 averaged only 3.2 per cent higher than in the 1916-20 period and in 1941-44 the yield was 18.0 per cent above the 1916-20 period. Cotton and tobacco yields were increased 45.0 and 56.0 per cent, respectively, during the period 1916-20 to 1941-44. These relatively large increases in yields of cotton and tobacco are due to many factors, such as better varieties, more adequate fertilization, and improved cultural practices. However, neither of these crops is being fertilized for maximum growth primarily because of the increased boll-weevil hazard in cotton and the possibility of producing inferior quality in tobacco. Since there is no present indication of any such serious complications from fertilizing for maximum growth in corn, there appear to be great potentialities for increasing corn yields in North Carolina.

Experiments in 1944

In 1944, 11 experiments were conducted to explore the possibilities of increasing corn yields by fertilization when adequate stands of adapted hybrids were used and properly cultivated. North Carolina adapted hybrids were used with a plant-spacing of about 16 inches in a 3.5 foot row. This spacing provides about 9,000 plants per acre which is 50 to 100 per cent higher than normal for the State. All row fertilizers were placed in bands about 3 inches on either side of the seed. Weeds were controlled by shallow cultivation until the corn was 2.5 feet high and then cultivation was stopped. The experiments were conducted under weather conditions ranging from excellent to very dry.

In going from an application of no-nitrogen up to 120 pounds of nitrogen per acre, the largest yield response was from 19 to 107 bushels, or an 88-bushel-per-acre increase, and the lowest response was from 18 to 51 bushels, or a 33-bushel-per-acre increase. The former was obtained under excellent moisture conditions and the latter under very droughty conditions. The average yields of all 11 experiments were 21, 32, 48, 59, 63, and 72 bushels per acre from plots receiving adequate phosphorus and potash and 0, 20, 40, 60, 80, and 120 pounds of nitrogen per acre, respectively.

Experiments in 1945

In 1945, fourteen experiments were conducted to get more information on some of the trends in the 1944 data and also to study some additional factors. The response to fertilizers in 1945 was quite comparable to that of 1944 wherever similar conditions were encountered. In order to obtain maximum

TABLE 1.—THE YIELDS AND PERCENTAGE INCREASE IN YIELDS OF CORN, COTTON, AND TOBACCO FROM 1916–1945 GIVEN IN FIVE-YEAR PERIODS FOR NORTH CAROLINA

Period	Corn		Cotton		Tobacco	
	Bus./A	Per cent change from 1916–20	Lbs./A	Per cent change from 1916–20	Lbs./A	Per cent change from 1916–20
1916–20.....	18.9	.....	262	.....	663	.....
1921–25.....	17.9	− 5.3	284	+ 8.4	643	− 2.3
1926–30.....	18.2	− 3.7	260	− 0.8	713	+ 7.5
1931–35.....	17.7	− 6.3	292	+11.4	782	+18.0
1936–40.....	19.5	+ 3.2	315	+20.2	900	+35.7
1941–45.....	22.3	+18.0	380	+45.0	1032	+56.0

Yield figures in this table were furnished by H. B. James of the Agricultural Economics Department.

fertilizer response, it has been necessary to provide adequate stands, use adapted hybrids, and employ improved cultural practices. An experiment on a Norfolk sandy loam in Hoke County illustrates these points quite well. This experiment involved four levels of nitrogen, four plant spacings, and four "varieties" grown in all combinations.

Adapted Hybrids Yield Better

The data in table 2a indicate that a well-adapted hybrid is able to make much more effective use of applied nutrients than is the native open-pollinated corn. The performance of the three hybrids used varied somewhat, but they were all far superior to the native corn. The average yields of all conditions, low to high nitrogen and wide to close spacing, were as follows:

N. C. hybrid 1028—55 bushels per acre (yellow);

N. C. hybrid 1111—57 bushels per acre (white);

N. C. hybrid 5002—60 bushels per acre (yellow);

Native one-eared corn—38 bushels per acre (white)

One can readily see the need of using adapted hybrids in a program for increasing corn yields.

Adequate Stand Necessary for High Yields

The extent to which the nitrogen supply determines the desirable thickness of stand is brought out in table 2b. At the lower levels of nitrogen, yields tended to be decreased at the closest spacing, while at the higher levels of nitrogen the yields were increased at the thicker planting. All three of the hybrids used were of the prolific type. The yield increase from close-spacing over that of wide-spacing at the higher nitrogen levels would have been expected to be even greater if single-eared hybrids had been used.

In another experiment in Pitt County (fig. 1) three spacings (4,000, 9,000, and 12,000 plants per acre) were tried at a high level of fertilization. The per-acre yields were 53, 82, and 93 bushels, respectively. Under these conditions of high fertilization, yields were increased about 75 per cent by increasing the plant stand.

It was interesting to note the differential weed growth in these plots during the growing season. The corn was free of weeds at "laying by" time (about 2.5 ft. high). However, by roasting-ear time the plot with 4,000 plants per acre had a solid cover of weeds (mainly cockleburs) about hip high, while in the plots with thick spacing, there were only a few small scattered weeds. The thickly planted corn was able to compete favorably with weeds until the corn was "made," even under these conditions of high rainfall and fertility. Four thousand plants per acre has been the conventional stand in some sections of the State.

Ample Nitrogen Required for High Yields

When adequate stands of adapted hybrids are used, large and profitable yield increases can be expected from adequate fertilization under most soil

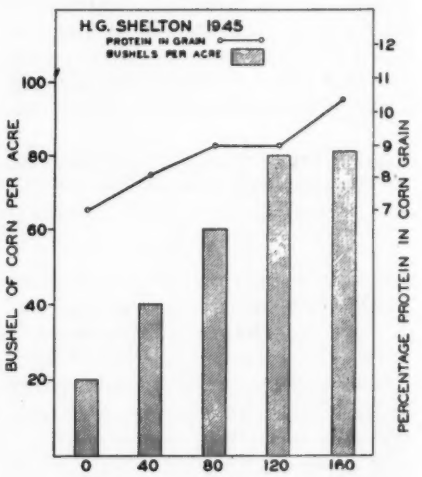

Fig. 2. The effect of nitrogen on corn yields and protein content of corn grain in an experiment conducted on Norfolk fine sandy loam, H. G. Shelton farm, Edgecombe County. All plots received phosphoric acid and potash. N. C. hybrid 1114 was spaced 16" apart in a 3.5-foot row, providing 9,300 plants per acre.

TABLE 2.—THE INFLUENCE OF VARYING FERTILIZATION, VARIETIES, AND PLANT STAND ON THE YIELD OF CORN IN BUSHELS PER ACRE ON NORFOLK LOAMY SAND, C. F. TAPP FARM, HOKE COUNTY.

a. The effect of fertilization on different varieties

	N. C. hybrid 5002	Local white variety
20–80–80	38	15
70–80–80	65	39
120–80–80	76	55
170–80–80	78	45
Least significant difference	9.4	9.4

b. The effect of spacing at variable nitrogen levels (ave. of three hybrids)

No. of plants per acre*	20–80–80	70–80–80	120–80–80	170–80–80
4,000	39	52	59	57
7,000	39	58	67	65
10,000	41	65	69	72
13,000	36	59	73	73
Least significant difference	8.3	8.3	8.3	8.3

* The 4,000, 7,000, 10,000, and 13,000 plants per acre were provided by plant spacings of 37.4", 21.4", 15.0", and 11.5", respectively, in a 3.5 ft. row.

conditions in North Carolina. In the experiment in Hoke County (table 2), yields were more than doubled when higher amounts of nitrogen were added. In an experiment in Edgecombe County where a no-nitrogen treatment was used as a base, the yield response due to nitrogen was even greater (see figure 2). It is particularly significant to note that within the range of response, 0 to 120 pounds per acre of nitrogen, the yields were increased about one bushel per acre for each two pounds per acre of nitrogen applied. Under optimum growth conditions, somewhat greater efficiencies have been obtained. However, we have obtained this efficiency in so many of our experiments that the "2 to 1 rule" has become a measuring stick in evaluating response to nitrogen.

The high July rainfall (60 per cent above normal) and high humidity made conditions very favorable for the development of *Helminthosporium maydis* (commonly called "leaf spot"). The leaves were seriously blighted by late roasting-ear stage and this condition appears to have limited the grain yield.

Corn responded significantly to nitrogen in 23 of the 25 experiments conducted during 1944 and 1945. The two experiments in which the yield response to nitrogen was not significant were located on clay loam Piedmont soils which encountered June and August droughts severe enough to limit yields to about 40 bushels per acre. In these two experiments, the soil nitrogen available to the corn following lespedeza was sufficient to produce the 40-bushel yield.

The average yields of all 25 experiments were 24, 46, 56, 63, and 70 bushels per acre from plots receiving adequate phosphorus and potash and 0, 40, 60, 80, and 120 pounds of nitrogen per acre, respectively (figure 6).

Experiments on Low Potash Soils

There are many dark-colored soils in the Coastal Plain where corn and soy-

beans have been grown continuously for many years with little or no fertilization, and the available potash supply has become depleted. To study this situation, an experiment was set up on a Coxville fine sandy loam which had been cropped to corn and soybeans in alternate rows for many years. For the past few years, the soybean yields have been about 4 bushels per acre and the corn yields ranged from 10 to 20 bushels per acre. In the experiment where a sufficient stand of an adapted hybrid was adequately fertilized, the yield was 93 bushels per acre (figure 3). However, when potash was omitted from the fertilizer the corn leaves showed marginal burning, the plants lodged badly, and the yield was only 62 bushels per acre. This soil contained only 0.11 m.e. of potassium (103 lbs. per acre of K_2O).* The yields were increased 31 bushels when 40 pounds per acre of K_2O (65 lbs. of muriate of potash) were applied, but no response was obtained from higher applications of potash. Rainfall and leaf disease conditions were similar to those in the Edgecombe County experiment and appeared to have limited yields at the higher levels of fertilization.

In another experiment conducted on a Coxville very fine sandy loam containing 0.04 m.e. of potassium, yields were increased 16 bushels by a 40-pound-per-acre application of K_2O. A 40-pound potash application increased the corn yields 24 bushels per acre on a Dunbar sandy loam soil in which the exchangeable potassium in the surface and subsoil was 0.10 and 0.04 m.e., respectively. In experiments where corn followed well-fertilized crops such as tobacco and cotton, no response to potash was found. Apparently the potash residues left in these soils were sufficient to produce at least one good corn crop.

Phosphate

Significant yield response to phosphorus was obtained in three Piedmont experiments where the soluble phosphorus content ranged from 3 to 6 p.p.m. (14 to 28 lbs. of P_2O_5 per acre). The greatest response was found on an Alamance silt loam where the yield

(*Turn to page* 45)

* Soil analyses were made under the supervision of J. R. Piland, Assoc. Soil Chemist.

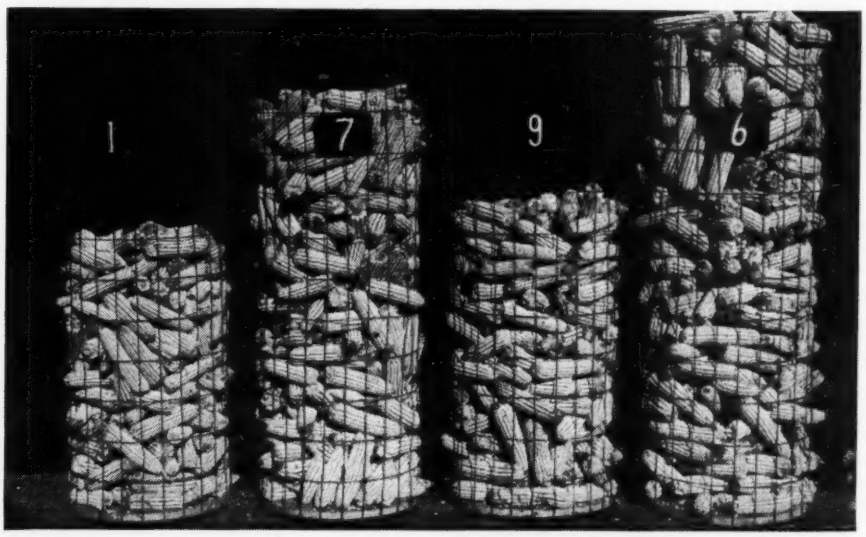

Fig. 3. These baskets represent corn yields from plots receiving 0-80-80, 200-0-80, 200-80-0, and 200-80-80 on a Coxville fine sandy loam, H. T. Stokes farm, Pitt County. The yields were 58, 79, 62, and 93 bushels per acre, respectively.

This ladino and timothy pasture will support high-producing cows and keep them in good milk flow all summer long.

Large Grasses for Pasture

By Ford S. Prince

Department of Agronomy, University of New Hampshire
Durham, New Hampshire

IN the Northeast, interest in pasture improvement which had its beginnings in the use of fertilizers on permanent pastures during the 1930's continues to hold the limelight so far as farm improvement on dairy farms is concerned. During the past year in New Hampshire, in connection with the organization of conservation subdistricts, farmers have had an opportunity to answer the question, "What in your opinion can the Soil Conservation Service do to help you most on your farm?" The overwhelming majority of replies indicated that farmers would like to have rough pasture lands bulldozed so that these areas can in the future be plowed or worked and seeded to more productive pasture crops.

There isn't very much question but that this request has sprung from a realization in the farmer's mind that the so-called permanent pasture does not solve the pasture problem. In spite of heavily fertilized bluegrass-white clover sods, there is a period of six weeks to two months in the summer when such pastures do not supply enough forage to meet the needs of high-producing cows. The result is that these same farmers who have been fertilizing their permanent pastures (and will continue to do so) are turning now to more productive, temporary, semi-permanent, or rotated pastures for more of their feed. Hence, the requests for bulldozing.

This means that the interest in pas-

tures is shifting rapidly from one of straight top-dressing to a frequent seeding program, on land that is kept in a fairly high state of fertility by manuring, liming, and fertilization. Fortunately, for the Northeastern dairyman, ladino clover has been introduced and is being used as a basis of all new seedings of this nature. Ladino has proved to be our most productive clover for pasture. It is not only high-yielding, but gives a good account of itself for four or five years or longer, if properly fertilized and if it isn't seeded with species that form too dense a sod. A heavy sod offers too much competition to ladino which is able to maintain itself somewhat better in an open than a tight sward.

Evaluating Grasses

Here in New Hampshire we have been using a half dozen of the larger grasses singly with ladino in an experimental way to try to evaluate each one of the grasses as to its productivity, palatability, compatibility with ladino, and like factors and at the same time to study the behavior of ladino in the simple mixtures. In some of the fields where studies have been made, there has been an opportunity to observe the behavior, survival, and yield of similar areas seeded to complex mixtures which contained seeds of the denser sod-forming species such as red top and Kentucky bluegrass.

We do not claim to have the last word on a study of this sort. We believe, however, that we have secured some information that may be of significance in furthering the use of ladino clover and also in helping evaluate the large grasses for use in the pasture reseeding program which lies ahead of the farmers in this region.

In 1942, when our first seedings of this nature were made, several of the large grasses were seeded singly with ladino in relatively small plots in the same field. The big disadvantage encountered with these small areas arose from the fact that the large grasses do not come to the grazing stage at the same time. Orchard grass is earliest; this is followed closely by smooth brome. The others, including reed canary, tall fescue, timothy, and perennial rye grass are more nearly alike in early growth. But since the plots in our 1942 and 1943 seedings were small, it was not possible to fence each grass or each group of grasses to pasture when it was most advisable. Since 1942, we have tried to remedy these experimental seedings by making them on a field scale. This method eliminates the disadvantages found in the earlier seedings but it increases the soil differences, thus increasing the variations between plots.

PASTURE YIELDS BY GRASSES

Grass	Pasture Years	Oven-dry material per acre—Tons
Smooth Brome	16	2.82
Orchard Grass	22	2.66
Tall Fescue	14	2.62
Perennial Rye	14	2.53
Timothy	18	2.50
Reed Canary	12	2.46

Since there is a great deal of interest in ladino and in these larger grasses which make a better midsummer growth than Kentucky blue or red top, we are presenting here the clipping records which have been made on the pastures seeded in 1942 and '43. The figures represent the average yields of all plots harvested in which the grasses in question were seeded with ladino clover on relatively small areas.

By pasture years, we mean that one plot was harvested one year. During that year, it may have been clipped four, five, six, or seven times so that 16 pasture years represent the summation of from 64 to more than 100 clippings.

Smooth brome shows up very well in these data, having the highest yield of all the grasses, although there is a

range of but .36 tons of dry weight of forage between smooth brome, the highest, and reed canary, the lowest yielder in the group. It is believed that the ladino in these seedings tended to iron out possible variations in yield and ladino was a constant in the seeding mixtures, as we have pointed out before.

It must also be understood that other grasses besides those seeded volunteered into the stand to a greater or lesser degree. Here in New Hampshire, as in all the Northeastern States, probably Kentucky bluegrass and bent grasses creep into any seeding after a year or two. The higher the fertility, the more likely this is to occur and these soils were all fairly well-fertilized, hence were not exceptions to this general rule.

Stand estimates at the close of the 1946 season indicated that these volunteer grasses occupied a greater percentage of the sward in the perennial rye grass plots than in the others. This is probably due to perennial rye being less hardy than the other grasses. On the other hand, orchard grass, reed canary, and tall fescue maintained their stands better than timothy, smooth brome, or the rye grass. This may be due in part to the greater palatability and consequently closer grazing by the animals on smooth brome, timothy, and rye grass, since in most cases the cows had access to them all at the same time.

With two exceptions, all the pastures in these tests were carefully managed to control grazing. There was a good stand of ladino on these two pastures in 1943 but very little in 1944. In another instance, near the seacoast, there was no snow cover during the winter of 1943 and the stand of ladino winter-killed. The result of losing the ladino in these three pastures was a reduction in yield of about one ton of dry forage per acre, when the 1943 and 1944 seasons are compared. The pastures in which the stand of ladino was not reduced yielded as well in 1944 as they had in 1943.

Another point of interest in yields is a comparison between the tall grasses and mixtures in which red top and Kentucky bluegrass were included in the same field and treated alike so far as fertility was concerned. The data

	Yield, dry weight per A.—Tons
Average of tall grasses.....	2.88
Average of complex mixtures.	2.63

show a quarter of a ton higher yield on the average for the simple mixtures with the larger grasses. Stand estimates in 1946 showed a lower percentage of clover in the plots seeded to complex mixtures than in those seeded to a single grass with ladino.

During the period of this study, fertilizer variables were not introduced since the variable among the plots was the grass. In most cases, the plots have been fertilized annually with manure and 0-14-14 or 0-20-20. If manure was not applied, a suitable complete fertilizer with a 1-2-2, 1-3-4, or 1-4-5 ratio was usually applied. It has been the aim to get from 70 to 100 pounds each of phosphoric acid and potash on the plots annually. The farmers who cooperated are believers in using a well-balanced fertilizer containing at least as much potash as phosphoric acid. In spite of certain differences in these grasses, we still believe that the most important thing to consider in making a pasture seeding is the use of ladino in the mixture. After the stand is secured, it is important to keep the ladino there by adequate fertilization and judicious management. The choice of a grass or grasses to use is of less importance since an excellent pasture can be made with any of the grasses that we have tried, provided the emphasis at first is on the ladino.

Naturally, however, and in spite of the foregoing statements, we prefer

some of the grasses over others on the grounds of cow preference, of how they behave in association with ladino, their persistence, and like factors. Because of the rather pronounced differences among the grasses, we have attempted to summarize their virtues as well as their disadvantages as we see them today in the following paragraphs.

Timothy is, of course, our old standby. It is very palatable, compatible with ladino, makes good hay or silage, has a long cutting period during which it does not become too woody, etc. It does not yield quite as well as we like, especially in hot weather, and it can be overgrazed. It is easy to seed, and the seed is relatively inexpensive. We believe that timothy will continue to form the foundation of most of our hay and many of our pasture seedings. New varieties like Marietta for an early strain and Milton and Lorain for later sorts will improve the place of timothy in our farming scheme by lengthening the harvesting and pasturing periods.

Smooth brome has yielded somewhat better than timothy in these tests, is the most palatable of any of the grasses, and works well with ladino. It makes excellent hay or silage and gives an earlier bite in the pasture than timothy. It can easily be overgrazed and because of its extreme palatability should be carefully managed. It is more difficult to seed than timothy or orchard grass since the seeds are too light and feathery to mix with clovers in the grass seed compartment of the grain drill. It can be mixed with the oats at seeding or it can be seeded separately and harrowed in. Many farmers have "fallen out" with it because of seeding difficulties. When they learn how to seed it, smooth brome will be a much more popular grass than it is today. Its gaining popularity is indicated by the fact that two of the cooperators in these tests during the past season have made their third seeding to smooth brome since 1942.

Orchard grass has not achieved the popularity of smooth brome or timothy largely because it isn't as palatable. Cows will eat it well if confined to it, however, and it comes on for grazing very early which is a distinct advantage in seasons following short

(*Turn to page* 41)

There are thousands of acres of pasture like this in New England that await improvement by some method of brush control, applying plant food, and seeding to ladino clover and grass.

Fertilizers and Human Health

By Firman E. Bear

Soils Department, Agricultural Experiment Station
New Brunswick, New Jersey

UNDER the stone floor of Westminster Abbey in London lies the body of one Thomas Parr who was born in 1483, lived through the reign of ten princes, and died at the age of 152. In his later years Parr became a celebrity and his death was finally brought about by overindulgence in food and drink. His long life is especially remarkable because in those days the average age attained by a human being was only about 20 years. Now that the span of life has been greatly increased one might expect to find an occasional man who had passed the two-century mark.

A Man Older Than Methuselah

The Russian census of 1926 revealed some 30,000 centenarians of whom the oldest was a 166-year old man living in Daghestan. But men have been known to live to be considerably older than that. One of the most interesting studies of old age in man was that of Bogomolets * who devoted his life to determining why people grow old prematurely. In his opinion a man of 60 or 70 had lived only half his natural life. To substantiate this he pointed to a considerable list of men and women who had attained an age of more than 150 years. Two of these had lived to be 185. One old gentleman and his wife dwelt together in connubial bliss to the ages of 172 and 164, respectively.

These and many other authenticated cases of longevity fall far short of Methuselah of Biblical fame who attained the ripe old age of 969. Yet he, in turn, was only a boy in comparison with Lew Wallace's Prince of India who was condemned to tarry on earth until Christ returned and, presumably, is still living as of the year 1946 A. D.

Knowing that the Prince of India was born of the imagination and that possibly Methuselah was as well, it seems best to be satisfied with a somewhat lesser span of life, say a couple of centuries. Two questions are raised:

1. Why do most men die before the age of 75?
2. Why do men die at all?

Trees Have Lived 5,000 Years

It might be best at this point to stop a moment and examine into the matter of longevity of a much simpler form of life, the plant. This was the subject of a lifetime of study by Molisch.* He concluded that, of the larger plants, the giant Sequoia trees of California had reached the greatest age. He estimated from their annual rings that the oldest of these trees had started their careers at least 2,000 years before the birth of Christ.

Molisch pointed out, however, that this longevity was more apparent than real. The old part of a tree was the dead wood in its center rather than the living tissue that surrounded it. From this living tissue new cells were produced but the old ones eventually died. He believed that, at best, the oldest living cells in these trees were probably not over 100 years of age.

* The Prolongation of Life. Translated by Peter V. Karpovitch and Sonia Bleeker; Duell, Sloan, and Pearce, Inc., New York, 1946.

* The Longevity of Plants. Translated by E. H. Fulling, The Science Press Printing Co., Lancaster, Pa., 1938.

The Simplest Forms of Life Live Longest

The possibilities for eternal life are greatest in the simplest forms of plant and animal life such as the single celled bacteria and protozoa. These reproduce by division and, presumably, could survive forever. Molisch recorded an experiment in which a single *Paramaecium* was bred for a period of 10 years through 8,000 generations and could, no doubt, have been kept going permanently. To accomplish this, however, it was necessary to transfer each newly-formed cell to a fresh nutrient solution.

It is known that bacteria can survive for long periods of time in a state of almost complete inactivity. Lipman * made a unique study of the span of life of microbes. For this study he obtained mud bricks from very old structures: a 600-year-old Arizona pueblo, a 1,000-year-old Mexican pyramid, a 1,400-year-old Peruvian pyramid, a 4,000-year-old Egyptian wall, and a 5,000-year-old Mesopotamian building. The outsides of these bricks were carefully sterilized by being soaked in a bath of paraffin at a temperature of 250° C. The bricks were then broken up with a sterile chisel and hammer and the outer paraffin-drenched material was removed. Small internal fragments were then placed in sterile water, the water was plated out, and the plates were incubated to see whether any bacterial colonies would develop. Selecting the 1,400-year-old Peruvian brick as an example, the counts showed 1,800,000 colonies per gram of stone.

Whales Are Longest-Lived Animals

The case of multicellular plants and of the larger forms of animals is considerably more complicated than that of the single-celled forms. It is generally believed that the multicellular forms must perish sooner or later. Life can be prolonged, however, by various devices. Thus plants that fruit only once and then die can be prevented from fruiting with the result that dying is delayed.

The growth habits of higher animals are altogether different from those of the higher plants. Animals develop in a closed system whereas plants follow an open one. Thus a horse never has more than four legs and having reached maturity, he never grows taller or longer. In contrast, oak trees develop new branches each year and continue to grow taller and to have a wider spread with advancing age.

Of the higher animals the longest-lived are the whale, elephant, tortoise, crocodile, pike, and parrot. Molisch records that whales may live several centuries. The conditions for survival would seem to be especially good for whales. They have a high degree of mobility by which they escape from their excretions and they live in seawater, which contains all the mineral elements that might conceivably be of value to whales. But even so a whale finally dies.

Fertilizers Blamed for Early Death of Man

Within recent years considerable publicity has been given to the idea that food produced from soil fertilized with chemicals is the cause of an increase in the prevalence of degenerative diseases in man. The proponents of this concept charge that agriculture's attempt to correct soil exhaustion with chemicals has not been successful. They say that inorganic fertilizers disturb the chemical balance of the soil and that this in turn affects the health of the animals that consume the crops. They advocate the use of manure instead of fertilizer.

The primary promoter of this concept of the value of manure as a health-promoting agent is Ehrenfried Pfeiffer* of Switzerland. The central theme of Pfeiffer's philisophy is that fertilizer drives away or destroys earthworms,

* Science in the University, University of California Press, Berkeley, 1944.

* Bio-Dynamic Farming and Gardening. Anthroposophic Press, New York, 1938.

bacteria, and fungi, the supposed generators of necessary life-giving substances in soils and plants.

Facts Fade Into Fancies

An international cult of Pfeiffer's followers is cluttering up our soils' literature with a mixture of facts and fancies that are so cleverly interwoven that it is very difficult to know where one leaves off and the other begins. The following quotations selected from the published statements of this group will serve to illustrate:

Pfeiffer: "The seeds and still more the leaves of plants fertilized with stable manure have the peculiarity, when used as food for animals, of increasing their capacity for resisting disease to a greater degree than the corresponding seeds and leaves of minerally fertilized plants. The former thus have a higher biological value than the latter."

***Howard**:** "What may be conveniently described as the NPK mentality dominates farming alike in experimental stations and the country-side. Vested interests, entrenched in time of national emergency, have gained a strangle hold. Artificial manures involve less labour and less trouble than farm-yard manure. The tractor is superior to the horse in power and in speed of work. . . . But these chemicals and these machines can do nothing to keep the soil in good heart. . . . In the years to come chemical manures will be considered as one of the greatest follies of the industrial era. . . . Mother earth has recorded her disapproval by the steady increase of disease in crops, animals, and mankind. . . . The population, fed on improperly grown food, has to be bolstered up by an expensive system of patent medicines, panel doctors, dispensaries, hospitals, and convalescent homes. A C_3 population is being created."

Balfour:** "In watching caterpillar and aphis attacks I have noticed that both compost- and chemically-grown plants will be attacked, but whereas the plant grown with chemicals . . . will . . . be stripped to the rib, those grown with compost . . . are only slightly damaged and quickly recover . . . Howard formed the opinion that the key to disease resistance was a fertile soil and that soil fertility could not be brought about by the use of artificial fertilizer. . . . His subsequent experiments convinced him that the best results were obtained when humus was scientifically manufactured *outside* the field, and that this humus was only fully effective if composed of ***both vegetable and animal wastes.***"

***Rodale**:** "Chemical fertilizers are a sort of dope or soil stimulant and can be compared to the taking of medicine . . . Between the chemicals and the spray poisons the biologic life of the soil is reduced almost to the vanishing point. Gone are the earthworms, and the bacteria and fungi almost disappear. The soil is practically dead. . . . In spite of billions of dollars spent for medical research work the average person today has more colds than his forebears and has more teeth cavities than his father and grandfather. Not only that but he suffers more from rheumatism, heart trouble, gall stones, ulcers, and arthritis."

A somewhat different approach, but one that leads to much the same conclusion with respect to fertilizers, is presented by some of the advocates of plowless farming:

Faulkner:** "This discovery (working organic matter into the surface soil rather than plowing it under) means that hereafter no one needs to buy nitrogen as a fertilizer. It means also that no one needs to grow legumes in order to have the benefit of the nitrogen they accumulate in the soil. Furthermore since lime is used on the land solely because it creates better conditions

* An Agricultural Testament. Oxford University Press, New York, 1940.
** The Living Soil. Faber and Faber, Ltd., London, 1943.

* Pay Dirt. The Devin-Adair Company, New York, 1945.
** Plowman's Folly. University of Oklahoma Press, Norman, 1943.

for legumes, there will no longer be a necessity for farmers to buy and apply lime to their soil. . . . Very early in the process of rejuvenating soil by restoring organic matter to its surface farmers will discover that no application of fertilizer, however great, results in an increased crop yield."

A closely related concept is found in the teachings of those who believe in the necessity of protecting earthworms against chemicals and in supplying large amounts of special organic foods designed to increase their rate of multiplication:

Barrett:* "In the earthworm we have a perfect, quick-acting humus factory. . . . In the chemical and mechanical laboratory of the earthworm's intestine are combined all the processes of topsoil building. The earthworm swallows great quantities of mineral earth, with all that it contains of vegetable and animal remains, bacteria, and the minute and microscopic life of the soil. In the powerful muscular mill of his gizzard, using grains of sand for millstones, the ingested material is thoroughly ground and mixed, as the abundant digestive secretions are poured in to exert their solvent and neutralizing action. Slowly the semi-liquid mass moves through the long intestine, undergoing further mixing as it takes on valuable animal hormones and substances. Finally it is ejected in and on the surface of the earth as castings—earthworm manure—humus—a crumbly, finely conditioned topsoil richly endowed with all the elements of plant nutrition in water-soluble form."

No Escape From The Dung Heap

The concepts of those who deal with the various aspects of "biodynamic farming," some of which are expressed and others implied, are as follows:

1. Plants, animals, and man are inseparably bound in Nature.
2. Disease resistance is conferred on plants, animals, and man by the use of manure.
3. Manure must contain both plant and animal by-products to provide these health-giving qualities.
4. Raw organic matter must be composted outside the soil or worked into the surface of the soil and not plowed under.
5. Fertilizers destroy earthworms and microbial life in the soil.
6. Earthworms are essential for the production of humus and for digesting the soil.
7. Micorrhizal fungi flourish only in manured soils and form a necessary living bridge between soil and plant.
8. Crops deteriorate when grown from seed of successive generations of plants produced by the use of fertilizers.
9. Diseases of man originate largely as a result of the use of fertilizers.
10. Fertilizers are only temporary expedients that must ultimately be discarded.

Such teachings link the farmer inseparably with the manure pile and peasantry. They set aside some of the most important findings of a century of agricultural science. They throw the 35-million-ton lime and fertilizer industries of this country into the discard. They decry the work of the agricultural experiment stations. Their proponents skip blithely from fact to fancy and fall back on the supernatural when pressed by the scientist.

Plants Are Only Source of Soil Organic Matter

Science came on the organic matter scene about a century ago when Justus von Liebig wrote a new page on this subject. His predecessors had contended that organic matter was the food of plants. Liebig pointed out that plants must have preceded the humus. Originally the earth and all its parts were entirely inorganic. All of the car-

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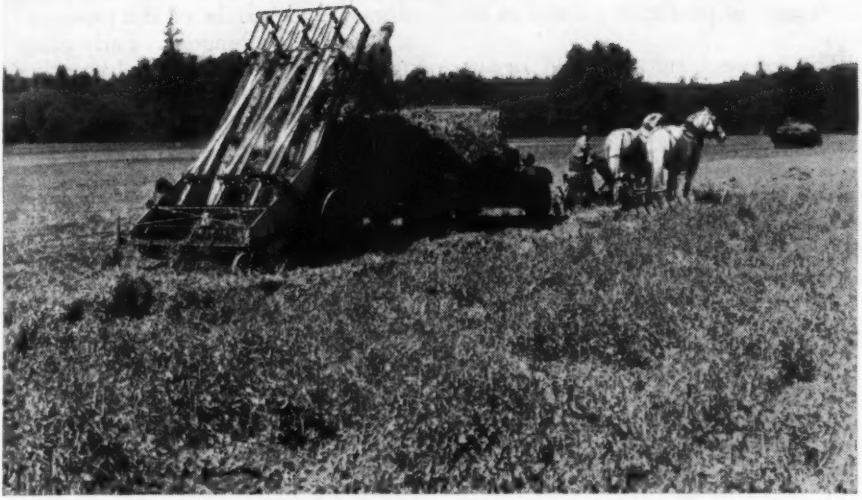
* The Earthmaster System. Thomas J. Barrett, Roscoe, California, 1943.



A scene from one of the earlier pea operations on the Raschke Brothers' farm near Chehalis. Horse-drawn equipment has been replaced with motorized equipment. The Raschke Brothers, however, are still growing peas.

Potash Pays for Peas At Chehalis, Washington

By Karl Baur and F. T. Tremblay

Western Washington Experiment Station, Puyallup, Washington

AS with many other successful agricultural ventures, the production of peas in the Chehalis Valley had a humble beginning. It was in 1933 when Tom Nesbit, Clarence Young, and Tom Fishback made experimental plantings of a little less than 40 acres of peas for the local cannery. The acreage was divided about equally between the varieties Surprise and Perfection. In 1934 these same men planted approximately 80 acres of the Alderman variety which was processed by freezing. The results both years were encouraging, the yields approximating two tons of high quality peas per acre. The peas were processed by the National Fruit Canning Company under the supervision of Walter Nichols.

The years 1935 and 1936, however, turned out to be rather unfavorable with low yields, and the reports indicate that these low yields were due in part to very poor weather conditions and heavy infestations of aphis which, in those days, were not dealt with as effectively as they are now. However, with the perseverance that is characteristic of many farmers, these men continued to plant peas with the encouragement of Mr. Nichols. These and other growers continued to plant

acreages of peas until in 1946 almost 5,000 acres of peas were planted in the area.

The growers and the field departments of the several concerns that now obtain peas from that area studied the problem of pea production under Chehalis conditions. After a period of time it was found that when peas were planted at what was then considered extremely early dates in the spring, a reasonably good crop could be expected.

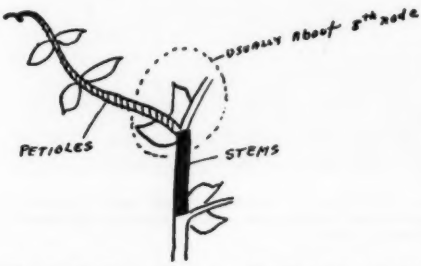


Fig. 1. Portions of stems and petioles to sample for tissue analysis when pea plants are 70-80 days old (two weeks before blossom).

Today some peas are planted in that area as early as the latter part of February and heavy plantings occur in March and April. May 10-15 is considered the deadline for planting by many growers and production men. The soil now used for the production of peas (practically 100% for processing by freezing) was formerly devoted to the production of oats, principally for grain. The returns per acre have probably been from two to three times as great from the production of peas as was the case when oats were grown. To this must be added the additional return in the form of pea vines which are used for ensilage and are well liked by dairymen as a feed for livestock. We hear much today about the reclamation of desert, swamp, and stump lands through irrigation, drainage, and clearing. To the people of Chehalis the switch from the low-acre value crops such as oats to peas is as important a reclamation project as are the others previously mentioned.

The development of pea growing in the Chehalis valley offers an additional advantage to certain of the processors in Western Washington. Early planting in that area means early harvesting. Many of the viners are started by June 25 and by the 4th of July the harvest is generally in full swing. These concerns obtain their early peas from Chehalis, then move their operations to the northern counties of Western Washington. At least one concern has had a pea processing run in excess of 90 days the last three years. The last of the peas were harvested after September 15 from the marsh lands in the vicinity of Snohomish. It is generally agreed that such long runs add to the efficiency of any processing operation.

The peas in the Chehalis area are grown almost exclusively on the river-bottom soils of the Chehalis, Newburg, and Wapato series. These soils are derived from residual materials of basaltic and marine origin (Olympic and Melbourne). The soils of the Chehalis series are principally silty clay loams which have developed a very fine structure and excellent drainage for the most part. These silty clay loam soils require considerable care in seedbed preparation. When worked too wet, they are susceptible to puddling and there is sufficient clay in the soils so that if allowed to dry beyond a certain point, they can be worked into a suitable bed only with a great deal of difficulty. Most growers in the area, however, do an excellent job of soil preparation. Most of the Chehalis soils are above the present flood plains. The Newburg soils occupy the present flood plains. The topography is undulating in character and consists principally of soils of a sandy loam texture.

The Wapato soils are darker in color and are underlain from 12 to 18 inches with highly impervious subsoils. Areas of Wapato soils are usually reserved for the later plantings. Excellent yields of peas have been obtained from them when drainage was sufficient and excessive rainfall did not occur during the critical period.

TABLE 1

Chehalis silty clay loam	pH	Exchangeable Nutrients* Pounds per acre		Available P† Lbs. per A.	Per cent Org. Matter
		Ca	K		
I. Topsoil	5.60	13,956	152	128	5.67
IA. Subsoil	5.65	13,664	69	72	4.42
II. Topsoil	5.65	13,144	129	128	5.92
IIA. Subsoil	5.75	11,836	65	80	2.87
III. Topsoil	5.75	13,040	148	138	5.81

* Extraction with neutral normal ammonium acetate.
† .002 N H_2SO_4 extraction according to Truog.

The plow layer of the soils mentioned above have pH values ranging from 5.5 to 6.5. The organic matter content ranges from 4.0% to 6.0%. Pertinent data concerning the Chehalis soils used in recent studies are given in Table 1.

Although the annual rainfall at the nearest station is around 45 inches, the precipitation pattern is characterized by rather dry summer months. The average precipitation for June is 1.79 inches and for July and August combined is 1.59 inches. Rainfall anywhere in Western Washington is subject to wide fluctuations.

There has developed a great local interest in supplemental irrigation by sprinkling. Very little irrigation was carried on, however, before 1940. Since then, installations have been made so rapidly that to all practical purposes the water supplies of the Chehalis River and its tributary streams have been appropriated to the practical present-day limits. One or two of the pea growers have applied water to this crop and the interest in the possibility of irrigating peas is growing by leaps and bounds.

Characteristic of the peas grown in the area is the extremely heavy nodulation produced on the roots. The nodule-producing organism is present in abundance wherever peas are planted, and artificial inoculation, with few exceptions, appears to be of little value on the river-bottom soils of the area. The viability of the inoculating organisms in these soils may perhaps be attributed to good drainage, a relatively high lime content, favorable pH, and the past successful production of vetches.

Fertilizer Studies

Fertilizers of any kind, with the exception of barnyard manure, were used very sparingly until the inception of the

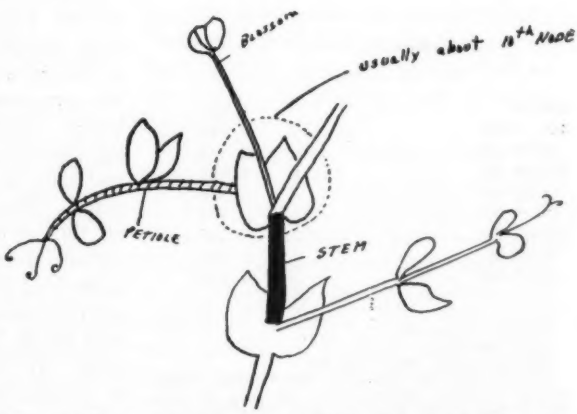


Fig. 2. Portions of stems and petioles to sample when pea plants are in full bloom (usually about 85-95 days).

AAA program, after which some phosphorus was applied to meadows and pea land.

Fertilizer studies with peas were inaugurated by the Soils Department of the Western Washington Experiment Station in 1944. The plots were located that year on Chehalis silty clay loam on the Tom Nesbit farm. The 1945 and 1946 experiments were also located on Chehalis silty clay loam on the Art Hamilton farm operated by Errett Deck. (Pertinent information on the soil of the Deck plots is given in Table 1).

The studies at Chehalis revealed two important facts concerning fertilizer requirements for peas in that area. They showed clearly the need of potash and phosphorus for maximum production of peas on these soils and also that the pre-drilling of fertilizer resulted in greater yields of peas than when the materials were broadcast and disced into the soil.

The results of the 1946 fertilizer ratio studies conducted at Chehalis are shown in Table 2.

As previously mentioned, the data in Table 2 show clearly the response obtained as a result of the application of phosphorus and potash when applied together. Of interest also is the trend toward even greater yields when the potash application was increased from 60 to 90 and 120 pounds per acre. The return of 1,000 lbs. of peas from an investment of 300 pounds of 0-20-20 per acre is indeed profitable. A return of at least $5.00 for every dollar invested in fertilizers has been obtained from the 300 lbs. per acre in the trials at Chehalis.

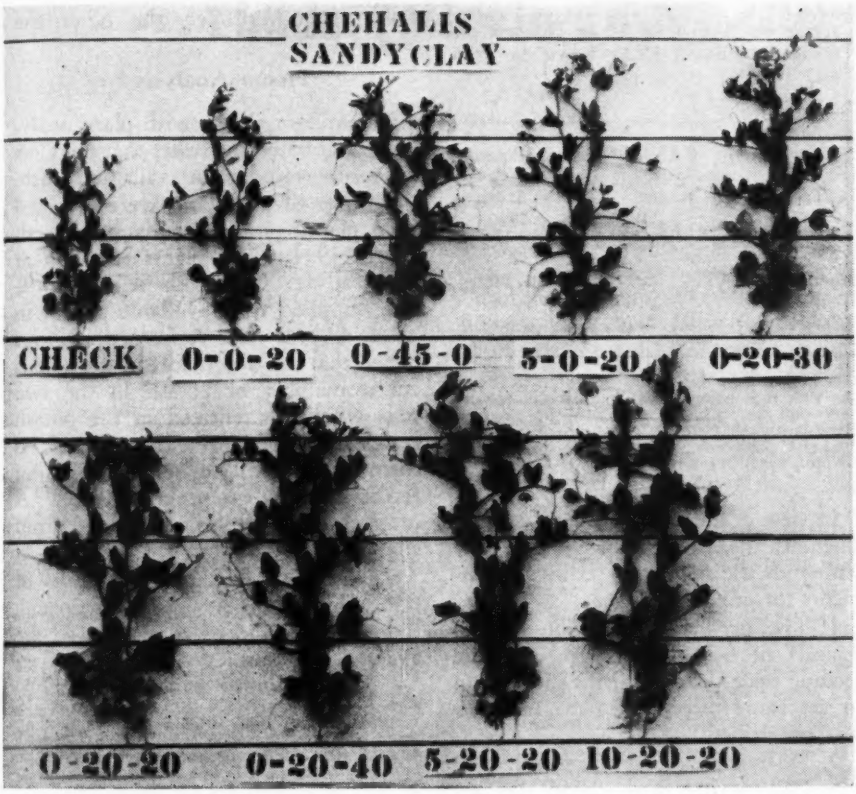
TABLE 2: EFFECT OF FERTILIZER ON YIELDS OF PEAS—CHEHALIS, 1946.

Treatment	
Check	2,843
30– 0–60	3,010
0–60– 0	3,299
15–60–60	3,863
0–60–60	3,859
0– 0–60	2,903
30–60–60	3,556
0–60–90	4,045
0–60–120	4,110

Variety, Bonneville.
Least significant difference (5% level) 315 lbs.
Unless otherwise indicated, the fertilizers were placed in bands approximately ½ inch to side and 1 inch deeper than the seed. The fertilizers were added in quantities of N, P_2O_5, and K_2O indicated in the table.

Nitrogen, on the other hand, applied with phosphate or potash or both failed to increase yields and, in fact, has resulted in suppression of yields on a number of occasions at Chehalis and in other pea-growing areas in Western Washington. The application of nitrogen results in a marked stimulation of the early growth of peas. Leaf size is increased appreciably and the plants appear vigorous and thrifty in the early part of the season. As the peas approach maturity, however, the rate of pod-filling and general growth decreases rather abruptly. It is assumed by the writers that the greater growth resulting from the nitrogen application demands a much greater supply of moisture than is required by the plants that have not been stimulated by nitrogen. Then because moisture supplies during July are at a critical level there is not enough left in the soil for the nitrogen-stimulated plants to complete their development.

Potash-deficiency symptoms on peas on the Chehalis soils usually appear most pronounced toward the later part of the growing season. The characteristic symptom is a scorch of the lower leaves. The leaves lose their normally light green color, soon wither and dry, and may in severe cases fall from the plant. These symptoms always appear on the lower leaves first and progress upward from the base of the plant. The growth of the entire plant and its component parts, particularly the leaves, was much less on the potash-deficient plots. While applications of 60 pounds of potash in combination with phosphoric acid have given splendid increases in yield, all of the potash-defi-



Comparative growth of peas resulting from the band application of 300 pounds per acre of the fertilizer mixtures indicated on the photograph.

ciency symptoms were not eliminated by such applications in 1946. Although no certain evidence is available, it appears that potash deficiency is more evident and more serious during dry seasons than in years when precipitation is more plentiful.

Numerous experiments on fertilizer placement by the Western Washington Experiment Station have shown clearly the advantage of band over broadcast application. No commercial drills designed to apply the fertilizer and seed in separate bands have been available for purchase. For this reason experiments were set up at Chehalis to compare broadcasting, pre-drilling, and precise placement. When pre-drilling the fertilizers, the materials were put into the fertilizer hopper of the ordinary pea drill with fertilizer attachments. The disc openers were set for maximum soil penetration. This operation was only for the application of the fertilizer. The seed was drilled in the next operation. It was necessary to use care in the seeding operation to avoid planting the seed too deeply.

The placement studies (Table 3) showed that under conditions encountered at Chehalis, pre-drilling the fertilizer resulted in yields almost as great as those obtained from the placement of fertilizer in precise positions in relation to the seed. Both the placed and pre-drilled fertilizer resulted in yields much above the broadcast treatment and those obtained from the unfertilized checks.

TABLE 3: EFFECT OF FERTILIZER PLACEMENT ON YIELD OF PEAS GROWN ON CHEHALIS SILTY CLAY LOAM IN 1945 AND 1946.

Treatment	Yield per acre—Pounds	
	1945	1946
Broadcast	2,274*	3,248
Pre-drilled	2,656	3,980
½" S, 1" B	2,726	3,835

Fertilizers used 1945—300 lbs. of 0-20-20 per acre with rock phosphate as source of phosphate; 1946—300 lbs. 0-20-20 with phosphate supplied from superphosphate.
* Least significant difference (5% level—1945, 251 lbs., 1946, 521 lbs.

In view of the results of the studies at Chehalis the Experiment Station recommends the following fertilizer treatments for peas in the area.

1. The pre-drill application of 300 pounds of 0-20-20 per acre. In the seeding operations the drills should run in the same direction as the fertilizer was pre-drilled.
2. Do not broadcast the fertilizer.
3. Do not use nitrogen in the fertilizer.
4. Drills may be used in tandem, one drilling the fertilizer, the other the seed.

Tissue Analysis *

Preliminary results with plant analysis substantiated the belief that the Chehalis soils were low in available potash.

Samples of pea plants were obtained from plantings at Chehalis and Puyallup in 1944. The plants obtained at Puyallup were from soils believed to be well supplied with available potash in so far as peas were concerned. It was hoped that the differences in the apparent availability of potash in the two soils would be reflected in the potash composition of the plants grown on them. Pea samples were obtained from fertilizer plots whenever possible. A number, however, were obtained from commercial plantings.

Tables 4 and 5 show the results of these analyses. As was anticipated, there was a marked difference in the average potassium content of the pea

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* Plant samples were dried at 70-80 degrees C. in an oven and ground in a Wiley mill to pass a 40-mesh sieve. 0.1 gram samples were ashed in an oven at 550 degrees C. The ash was dissolved in 2 per cent acetic acid, and the potash precipitated with sodium cobaltrinitrite. The precipitate was washed and the amount of potash present was determined volumetrically using 0.05 N. potassium permanganate.

TABLE 4: POTASSIUM CONTENT OF LEAVES AND STIPULES FROM RANDOM PLANT SAMPLES TAKEN IN THE CHEHALIS AREA IN 1944.

Chehalis (Chehalis silty clay loam)

Grower	Stage of plant growth	Per cent K	
		Leaves	Stipules
Nisbet	Pods ¾ ripe	0.29	0.40
Nisbet	Pods ½ ripe	0.40	0.49
Senn	Pods ¾ formed	0.50	0.44
Goernt	Pods ¾ formed	0.90	0.88
Goernt	Pods ⅛ formed	1.06	1.01
Etheridge	Pods ¾ ripe	1.07	1.17
Hamilton	Before bloom	1.33	1.30
Young	Blossoms	1.39	1.17
Goernt	Blossoms	1.49	1.34
Fitz	Pods ¾ formed	1.54	1.69
	Average	1.00	0.99

Yields Tell The Story

By J. Lloyd Burrell

Information Service, Production and Market Administration
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DOES a planned agricultural program pay? Editor Ernest Camp thinks it has in the case of Walton County farmers in Georgia.

"Good farm planning, with a liberal application of sweat and good fertilizers, has brought us farm profits," this editor wrote in the tenth agricultural edition of his Walton Tribune, weekly newspaper in Monroe, Georgia.

"When in a period of less than 10 years, crop yields rise in some cases to an increase of 100 per cent, a marked stride towards better agricultural methods is proven," he said. "Incredible as it seems, the same acre of ground is doing twice as much work for us as it did 10 years ago."

Rapid Progress

Walton County farmers have, of course, been improving agriculture for many years, but H. H. Shores, their county agent for the Agricultural Extension Service, can show a fast rate of progress since the first concentrated agricultural program was inaugurated in 1938.

Briefly, in eight years, the per-acre yield of cotton has risen to 500 pounds of lint; less acreage of sweet potatoes is bringing a quarter million dollars more; less acreage of corn is producing over 200,000 bushels more; dairy products marketed have jumped from $33,000 to $238,000; and broiler production has skyrocketed from 5,000 to 1,200,000.

Back in 1938, County Agent Shores and Home Demonstration Agent Miss Anna Holbrook got together with representatives of the other agriculture agencies in Walton County. A six-point agricultural plan was the result, with emphasis on feed and soil-improvement crops, livestock, and cash crops. Later, in 1943, this plan was increased to a 12-point scheme, in order to care for expanding agriculture and related activities.

Walton County is in the northern half of Georgia, near Atlanta, and despite the fact that it is one of the state's biggest (and best) cotton counties, it ranks with any of Georgia's other 158 counties from the standpoint of diversification. Let's look over Walton farmers' 1946 Better Farming 12-Point Agricultural Program and see what it has to offer, as well as how it operates.

Cotton is point number one. Every community in the county is a one-variety cotton community, and all communities are joined in a county-wide organization. More than 99 per cent of the annual acreage is planted to the same high-yielding, improved variety.

"Among the reasons for our phenomenal success with cotton are use of a liberal amount of well-balanced fertilizer and the treatment of planting seed," County Agent Shores explains.

And speaking of phenomenal success with cotton, Walton farmers have won two state-wide awards for excellence in production of this fleecy crop. At the beginning of the war, they were presented with a trophy signifying greatest achievement in cotton production for the year in Georgia. In 1945 one of Walton's communities produced an average per-acre yield of 525 pounds of lint to win another state trophy.

Mr. Shores advises farmers to plant cotton on good land, fertilize heavily, plant in 30- to 36-inch rows, two stalks in hills 8 to 12 inches apart, and fight

the boll weevil and other insects. For fertilizing cotton generally, he recommends 600 to 800 pounds of 4-8-6.

"The 1938 income from cotton in Walton County as indicated by the U. S. Department of Agriculture was $1,266,458. The income in 1945 on 6,000 less acres is estimated to be $3,606,200. The advanced price of cotton has had some bearing on this difference but the yield per acre since 1938 has increased approximately 200 pounds, which would indicate better farming methods and better selection of seed."

Incidentally, Walton's 1945 estimated per-acre yield of 500 pounds lint is the highest ever recorded in Georgia for a county average.

The number two point for 1946 is sweet potatoes, a supplemental cash crop to cotton. In 1938 the potato was introduced as a supplemental cash enterprise, the variety being the improved Puerto Rican. Every family who has suitable soil and sufficient labor is urged to grow sweet potatoes for early market. In 1945 growers realized $251,000 more for their potatoes than in 1938, and the yield has increased about 100 bushels per acre. To grow this cash crop in the quickest possible time for the early market, Walton growers fertilize the potatoes with 600 to 800 pounds of 4-8-12.

A year-round garden for every farm family—an ultimate goal in Walton County—is point number three. Recommended size of the garden is one-fourth to one-half acre for home use, and one acre for canning and sale. Heavy fertilization is advised. Community canning plants are operated by vocational agriculture teachers, and one freezer locker is now serving many Walton families. These two preservation sources are contributing greatly to improving the food supply and are affording means of preserving the surplus garden vegetables for off-season use.

Point number four recommends the setting out of a home orchard, berry patch, and grape vineyard. New home orchards in this Georgia county are very noticeable since the inauguration of the intensive farm planning program eight years ago.

The fifth point explains that every farm family should have two good dairy cows and should use good bulls.

"Farmers who have sufficient cows and home-grown feeds are urged to sell grade "A" or "B" milk, since markets are already established for both in the county," Agent Shores points out. Recent years have seen tremendous increases in Walton's dairy production. The value of dairy products sold has increased seven times in seven years.

Grow out one beef cow for home consumption is number six in Walton's 12-point farm plan. And if home-grown feed is available, farmers are advised to grow out as many extra animals as possible for market. The county now has at least three outstanding registered beef cattle herds and others of grade and purebred beef.

Two hogs for each farm are recommended in point seven. In addition, production of hogs for market is strongly advised if feed on the farm is available.

"Every farm operator," says County Agent Shores, "is urged to have one brood sow to furnish pigs for his own use and for his tenants. We also advise the growing of one to three grazing crops for hogs."

Grow out at least 200 baby chicks and save 50 of the best pullets for laying hens—that's point number eight. For growth of broilers on a large scale, plenty of planning is recommended to help insure profitable returns. For Walton farmers, commercial broiler production has skyrocketed since 1938—from $2,500 to more than a million-dollar enterprise.

One big underlying factor in Walton's agricultural success is point number nine; namely, feed and soil improvement crops. Today, farmers in this

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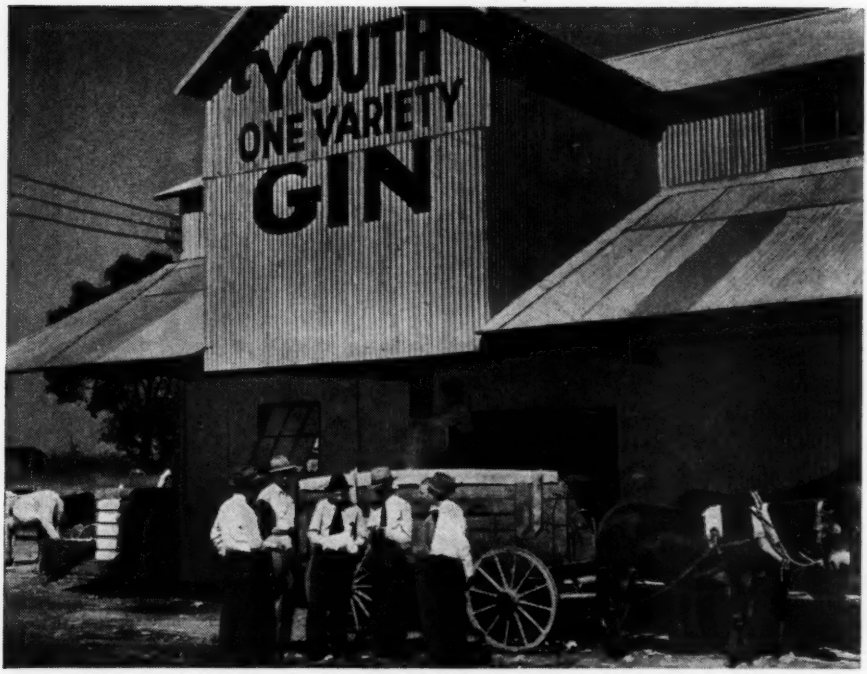
J. F. Hester, Walton County farmer, points out to County Agent H. H. Shores the diversification he is practicing on his farm.

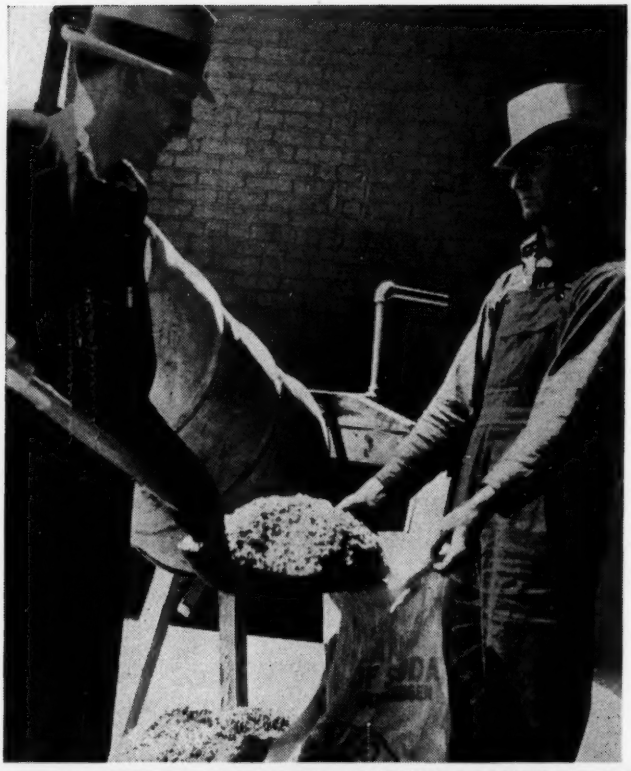


Above: Walton farmers use all the approved practices of cotton production, including good ginning.

Below: Fertilization and other good practices mean better pasturage for Walton County livestock.

Above: Here is an electrically heated hot-bed for sweet potato plants used by Walton farmers.

Below: Dairying occupies a big part in the Walton farm set-up and good mules supply farm power.



Left: Seed treatment is an important step in Walton County cotton production. Last year farmers in this Georgia county produced more than 26,000 bales on approximately 26,000 acres.

Below: (Left to right) L. I. Skinner, Ass't. Dir., Ga. Agr. Ext. Serv., J. T. Byrd, Pres. of Cotton Improvement Assoc., and H. H. Shores, Walton County Agent, admire trophy presented for excellence in lint production practices which include liberal use of fertilizers.

The Editors Talk

A New Film on Boron

Only recently has boron assumed a field of importance in plant nutrition. Where once we used to say that the list of minor elements could be taken care of by the catchy words "C Hopkns Cafe Mg. (mighty good)" we now have to add a number of other elements including boron as essential for plant growth. The comparatively small quantities involved caused these elements to be overlooked in earlier investigations since they were furnished by impurities in the materials used or the containers, like glass, in which the plants were grown. Modern techniques have changed this picture and reinvestigation of many projects once thought closed has necessitated conclusions entirely different from those originally drawn.

The famous boron experiments at Williamsburg, Virginia, conducted over the last several years have furnished striking results on the use of borax on alfalfa. Conversation with a plant pathologist disclosed, however, that around 1900 he was called to investigate trouble growers had been experiencing with alfalfa in that area, but lack of boron as the cause was never suspected. For many years it was felt that the growing of alfalfa was not a practical or profitable practice over most of the South. It has now been found by the use of boron and potash along with the previously recognized lime and phosphate that alfalfa will produce fine crops over most of this region. Many sections were having difficulties in maintaining the yield and quality of their vegetables and fruits due to trouble which was thought to be disease but which now has been found to be boron deficiency. Numerous other instances undoubtedly could be cited, and recognition of the necessity for boron and other minor elements is changing agricultural practices over wide areas of the country.

In order to acquaint agricultural audiences with the symptoms of boron deficiency, how boron can be used, and its source, a film entitled *Borax From Desert to Farm* has recently been released. This motion picture was sponsored by the two largest borax producers in America—the American Potash and Chemical Corporation and the Pacific Coast Borax Company. It is being distributed by the American Potash Institute under whose direction it was produced with the helpful cooperation of many agricultural experiment stations and extension staffs including Alabama Agricultural Experiment Station, University of California, Clemson Agricultural College, Cornell University, University of Maryland, New York State Agricultural Experiment Station and Extension Service, Virginia Agricultural Extension Service, and the University of Wisconsin. This 16 mm. color film has a commentary on the sound track describing the background and action as they are being shown.

The picture opens with scenes in California showing the beautiful and interesting country in which borax is produced. Colorful scenes in the desert around Searles Lake and in Death Valley as well as at the two producing plants are shown. Brief mention is made of the industrial uses of borax especially in the glass, enamel, and chemical industries. From there the film turns to the

agricultural side of borax usage. Commonly recognized symptoms due to boron deficiency are shown for a large number of crops including apples, olives, alfalfa, celery, sugar and table beets, cauliflower, sweet potatoes, and others.

The American Potash Institute will be pleased to loan *Borax From Desert to Farm* to agricultural colleges and experiment stations, county agricultural agents, vocational teachers, other responsible agricultural advisory and farm groups, and members of the fertilizer trade. Requests for bookings should be directed to the Institute at 1155 Sixteenth St., N. W., Washington 6, D. C., its home office.

The Southerners Take Stock

At the 44th annual convention of the Association of Southern Agricultural Workers held in Biloxi, Mississippi, January 15-17, nearly 2,000 of the South's men and women of science took inventory of their assets and liabilities. They not only were reviewing the war years, during which no conventions were held, but were looking ahead through the next 10 years.

Sessions of the meeting were likened to a 16-ring circus. If there could be any criticism of the program, it would be that so much was taking place simultaneously that one person could not cover all spots of interest. Sectional groups included agricultural and rural sociology, agricultural editors, agricultural engineers, agronomy—soils and crops, animal husbandry, commissioners of agriculture, dairy science, entomologists, forestry, home economics, horticultural science, marketing, phytopathology, plant physiology, poultry, and soil conservation. Leaders in the respective fields presented problems and the results of research work.

In referring to the financial progress of the farmers of the South, W. C. Lassetter of Memphis, Tennessee, out-going president of the Association, listed five points for consideration:

1. Bank deposits in the country banks now are six times larger than they were in 1939 and 1940.
2. The farmers have more cash in their pockets than during these same years.
3. They have additional money in such things as bonds, which can be converted into cash.
4. They have another high cash potential in their present investments in quality livestock—a much bigger investment than ever before.
5. The farm mortgage indebtedness is at its lowest point in years, having been reduced by more than $800,000,000 in 17 years to a low now of about $1,200,000,000.

Mr. Lassetter stated that of all the farms in the country providing their owners with a $1,000 annual cash income (equal to $1,700 for a city worker) 42 per cent of them are in the 14 Southern states.

To science was given most of the credit for this progress. The South has learned to restore and maintain the fertility of her soils. She has learned the growing of pastures for quality livestock. She has learned to diversify along other lines and to mechanize to cut costs of production. As in agriculture in any other territory or with any other industry anywhere, there are still many more problems to be solved. That most of these will be, before another 10 years roll around, is guaranteed by the eager interest everywhere evident at this convention.

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb.	Tobacco Cents per lb.	Potatoes Cents per bu.	Sweet Potatoes Cents per bu.	Corn Cents per bu.	Wheat Cents per bu.	Hay Dollars per ton	Cottonseed Dollars per ton	Truck Crops
	Aug.-July	.....	July-June	July-June	Oct.-Sept.	July-June	July-June	July-June	....
Av. Aug. 1909–July 1914	12.4	10.0	69.7	87.8	64.2	88.4	11.87	22.55	....
1920	15.9	17.3	125.3	141.7	61.8	182.6	16.46	25.65	....
1921	17.0	19.5	113.3	113.1	52.3	103.0	11.63	29.14	....
1922	22.9	22.8	65.9	100.4	74.5	96.6	11.64	30.42	....
1923	28.7	19.0	92.5	120.6	82.5	92.6	13.08	41.23	....
1924	22.9	19.0	68.6	149.6	106.3	124.7	12.66	33.25	....
1925	19.6	16.8	170.5	165.1	69.9	143.7	12.77	31.59	....
1926	12.5	17.9	131.4	117.4	74.5	121.7	13.24	22.04	....
1927	20.2	20.7	101.9	109.0	85.0	119.0	10.29	34.83	....
1928	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937	8.4	20.4	52.9	82.0	51.8	96.2	8.74	19.51	....
1938	8.6	19.6	55.7	73.0	48.6	56.2	6.78	21.79	....
1939	9.1	15.4	69.7	74.9	56.8	69.1	7.94	21.17	....
1940	9.9	16.0	54.1	85.5	61.8	68.2	7.58	21.73	....
1941	17.0	26.4	80.7	94.0	75.1	94.5	9.67	47.65	....
1942	19.0	36.9	117.0	119.0	91.7	109.8	10.80	45.61	....
1943	19.9	40.5	131.0	204.0	112.0	136.0	14.80	52.10	....
1944	20.7	42.0	149.0	192.0	109.0	141.0	16.40	52.70	....
1945	22.4	42.6	139.0	200.0	114.0	149.0	15.10	51.80	....
1946									
January	22.36	36.3	145.0	208.0	110.0	154.0	15.70	50.90	....
February	23.01	33.9	146.0	223.0	111.0	155.0	15.80	50.30	....
March	22.70	31.9	157.0	236.0	114.0	158.0	16.30	47.50	....
April	23.59	42.9	162.0	245.0	116.0	158.0	15.00	48.00	....
May	24.09	43.0	157.0	251.0	135.0	170.0	14.80	49.60	....
June	25.98	59.0	147.0	251.0	142.0	174.0	14.70	51.50	....
July	30.83	56.7	148.0	275.0	196.0	187.0	15.00	60.00	....
August	33.55	48.6	143.0	280.0	180.0	178.0	15.10	59.10	....
September	35.30	48.8	128.0	224.0	173.0	179.0	15.40	57.80	....
October	37.69	53.0	122.0	209.0	171.0	188.0	16.10	66.00	....
November	29.23	43.8	123.0	200.0	127.0	189.0	17.20	89.90	....
December	29.98	43.5	126.0	210.0	122.0	192.0	17.70	91.50	....
Index Numbers (Aug. 1909—July 1914 = 100)									
1920	128	173	180	161	96	207	139	114	....
1921	137	195	163	129	81	117	98	129	....
1922	185	228	95	114	116	109	98	135	....
1923	231	190	133	137	129	105	110	183	....
1924	185	190	98	170	166	141	107	147	143
1925	158	168	245	188	109	163	108	140	143
1926	101	179	189	134	116	138	112	98	139
1927	163	207	146	124	132	135	87	154	127
1928	145	200	76	134	131	113	95	152	154
1929	135	183	189	133	124	117	92	137	137
1930	77	128	131	123	93	76	93	98	129
1931	46	82	66	83	50	44	73	40	115
1932	52	105	55	62	50	43	52	46	102
1933	82	130	118	79	81	84	68	57	91
1934	100	213	64	91	127	96	111	146	95
1935	90	184	85	80	102	94	63	135	119
1936	100	236	164	106	163	116	94	148	104
1937	68	204	76	93	81	109	74	87	110
1938	69	196	80	83	76	64	57	97	88
1939	73	154	100	85	88	78	67	94	91
1940	80	160	78	97	96	77	64	96	111
1941	137	264	116	107	117	107	81	211	129
1942	153	369	168	136	143	124	91	202	163
1943	160	405	188	232	174	154	125	231	245
1944	167	420	214	219	170	160	138	234	212
1945	181	435	199	228	178	169	127	230	224
1946									
January	180	363	208	237	171	174	132	226	249
February	186	339	209	254	173	175	133	223	275
March	183	319	225	269	178	179	137	211	283
April	190	429	232	279	181	179	126	213	282
May	194	430	225	286	210	192	125	220	177
June	210	590	211	286	221	197	124	228	185
July	249	567	212	313	305	212	126	266	163
August	287	486	205	319	280	201	127	262	162
September	285	488	184	255	269	202	130	256	154
October	304	530	175	238	266	213	136	293	151
November	236	438	176	228	198	214	145	399	207
December	242	435	181	239	190	217	149	406	166

Wholesale Prices of Ammoniates

	Nitrate of soda per unit N bulk	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory, bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1922	3.04	2.58	6.07	4.66	4.75	4.99
1923	3.02	2.90	6.19	4.83	4.59	5.16
1924	2.99	2.44	5.87	5.02	3.60	4.25
1925	3.11	2.47	5.41	5.34	3.97	4.75
1926	3.06	2.41	4.40	4.95	4.36	4.90
1927	3.01	2.26	5.07	5.87	4.32	5.70
1928	2.67	2.30	7.06	6.63	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.61	5.72
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.58	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945	1.75	1.42	7.81	5.77	4.86	6.71
1946						
January	1.75	1.42	7.81	5.77	4.86	6.71
February	1.75	1.42	7.81	5.77	4.86	6.71
March	1.75	1.42	7.81	5.77	4.86	6.71
April	1.75	1.42	7.81	5.77	4.86	6.71
May	1.75	1.42	9.08	6.10	4.86	7.30
June	1.88	1.42	10.34	6.42	4.86	7.90
July	1.88	1.42	11.62	8.15	5.34	9.60
August	2.22	1.46	16.88	8.14	6.07	12.14
September	2.22	1.46	10.32	6.95	6.07	12.14
October	2.22	1.46	13.20	7.12	8.30	12.14
November	2.22	1.46	15.19	11.26	12.14	12.75
December	2.22	1.46	14.63	11.37	12.14	11.90
Index Numbers (1910-14 = 100)						
1922	113	90	173	132	140	142
1923	112	102	177	137	136	147
1924	111	86	168	142	107	121
1925	115	87	155	151	117	135
1926	113	84	126	140	129	139
1927	112	79	145	166	128	162
1928	100	81	202	188	146	170
1929	96	72	161	142	137	162
1930	92	64	137	141	12	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945	65	50	223	163	144	191
1946						
January	65	50	223	163	144	191
February	65	50	223	163	144	191
March	65	50	223	163	144	191
April	65	50	223	163	144	191
May	65	50	259	173	144	207
June	70	50	295	182	144	224
July	70	50	332	231	158	273
August	83	51	482	231	180	345
September	83	51	295	197	180	345
October	83	51	377	202	246	345
November	83	51	434	319	360	362
December	83	51	418	322	360	338

Wholesale Prices of Phosphates and Potash**

	Superphosphate Baltimore, per unit	Florida land pebble 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[1]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1922	.566	3.12	6.90	.632	.904	23.87	....
1923	.550	3.08	7.50	.588	.836	23.32	....
1924	.502	2.31	6.60	.582	.860	23.72	....
1925	.600	2.44	6.16	.584	.860	23.72	....
1926	.598	3.20	5.57	.596	.854	23.58	.537
1927	.525	3.09	5.50	.646	.924	25.55	.586
1928	.580	3.12	5.50	.669	.957	26.46	.607
1929	.609	3.18	5.50	.672	.962	26.59	.610
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.90	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.570
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945	.650	2.20	6.23	.522	.777	25.35	.195
1946							
January	.650	2.20	6.40	.535	.797	26.00	.200
February	.650	2.20	6.40	.535	.797	26.00	.200
March	.650	2.20	6.40	.535	.797	26.00	.200
April	.650	2.20	6.40	.535	.797	26.00	.200
May	.650	2.20	6.40	.535	.797	26.00	.200
June	.650	2.30	6.45	.471	.729	22.88	.176
July	.650	2.60	6.60	.471	.729	22.88	.176
August	.700	2.60	6.60	.471	.729	22.88	.176
September	.700	2.60	6.60	.471	.729	22.88	.176
October	.700	2.60	6.60	.471	.729	22.88	.176
November	.700	2.60	6.60	.535	.797	26.00	.200
December	.700	2.60	6.60	.535	.797	26.00	.200

Index Numbers (1910-14 = 100)

1922	106	87	141	89	95	99	....
1923	103	85	154	82	88	96	....
1924	94	64	135	82	90	98	....
1925	110	68	126	82	90	98	....
1926	112	88	114	83	90	98	82
1927	100	86	113	90	97	106	89
1928	108	86	113	94	100	109	92
1929	114	88	113	94	101	110	93
1930	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945	121	61	128	73	82	105	83
1946							
January	121	61	131	75	84	108	83
February	121	61	131	75	84	108	83
March	121	61	131	75	84	108	83
April	121	61	131	75	84	108	83
May	121	61	131	75	84	108	83
June	121	64	132	66	76	95	80
July	121	72	135	66	76	95	80
August	131	72	135	66	76	95	80
September	131	72	135	66	76	95	80
October	131	72	135	66	76	95	80
November	131	72	135	75	84	108	83
December	131	72	135	75	84	108	83

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1922	132	149	141	116	101	145	106	85
1923	143	152	147	114	107	144	103	79
1924	143	152	143	103	97	125	94	79
1925	156	156	151	112	100	131	109	80
1926	146	155	146	119	94	135	112	86
1927	142	153	139	116	89	150	100	94
1928	151	155	141	121	87	177	108	97
1929	149	154	139	114	79	146	114	97
1930	128	146	126	105	72	131	101	99
1931	90	126	107	83	62	83	90	99
1932	68	108	95	71	46	48	85	99
1933	72	108	96	70	45	71	81	95
1934	90	122	109	72	47	90	91	72
1935	109	125	117	70	45	97	92	63
1936	114	124	118	73	47	107	89	69
1937	122	131	126	81	50	129	95	75
1938	97	123	115	78	52	101	92	77
1939	95	121	112	79	51	119	89	77
1940	100	122	115	80	52	114	96	77
1941	124	131	127	86	56	130	102	77
1942	159	152	144	93	57	161	112	77
1943	192	167	151	94	57	160	117	77
1944	195	176	152	96	57	174	120	76
1945	202	180	154	97	57	175	121	76
1946								
January	206	184	156	97	57	175	121	78
February	207	185	156	97	57	175	121	78
March	209	187	158	97	57	175	121	78
April	212	188	160	97	57	175	121	78
May	211	192	162	99	57	189	121	76
June	218	196	163	100	60	203	121	70
July	244	209	181	103	60	230	121	70
August	249	214	187	116	67	293	131	70
September	243	210	181	108	67	223	131	70
October	273	218	197	115	67	286	131	70
November	263	224	198	127	67	382	131	78
December	264	225	204	127	67	376	131	78

* U. S. D. A. figures. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Since June 1941, manure salts are quoted F.O.B. mines exclusively.

**** The weighted average of prices actually paid for potash are lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period. Since 1937, the maximum discount has been 12%. Applied to muriate of potash, a price slightly above $.471 per unit K_2O thus more nearly approximates the annual average than do prices based on arithmetical averages of monthly quotations.**

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Fertilizer Sales, By Grades, 1946 Season," Ala. Coop. Crop Reporting Serv., Office of Agr. Statistician, 121½ Lee St., Montgomery 4, Ala., Oct. 16, 1946.

"Agricultural Mineral Sales as Reported to Date for Quarter Ended September 30, 1946," Bu. of Chem., Dept. of Agr., Sacramento 14, Calif., FM-134, Dec. 12, 1946.

"Commercial Fertilizer Sales as Reported to Date for Quarter Ended September 30, 1946," Bu. of Chem., Dept. of Agr., Sacramento 14, Calif., FM-135, Dec. 12, 1946.

Supplemental List, Commercial Fertilizers Registrants for the Fiscal Year Ending June 30, 1947," Bu. of Chem., Dept. of Agr., Sacramento 14, Calif., FM-136, Dec. 26, 1946.

"Supplemental List, Agricultural Minerals Registrants for the Fiscal Year Ending June 30, 1947," Bu. of Chem., Dept. of Agr., Sacramento 14, Calif., FM-137, Dec. 26, 1946.

"Chemical Investigations of the Metabolism of Plants: I. The Nitrogen Nutrition of Narcissus Poeticus," Agr. Exp. Sta., New Haven, Conn., Bul. 496, Feb. 1946, H. B. Vickery, G. W. Pucher, A. J. Wakeman, and C. S. Leavenworth.

"Inspection of Commercial Fertilizers," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., Cir. 318, April, 1946.

"Inspection of Commercial Fertilizers and Agricultural Lime Products," Agr. Exp. Sta., Mass. State College, Amherst, Mass., Bul. 130, July, 1946.

"Liquid and Solid Sources of Nitrogen for Cotton Production, 1943-45," Agr. Exp. Sta., Miss. State College, State College, Miss., Serv. Sheet 399, Jan. 1946, John Pitner and F. E. Edwards.

"Placement of Nitrogen Fertilizer for Corn and Oats," Agr. Exp. Sta., Miss. State College, State College, Miss., Serv. Sheet 400, Feb. 1946, John Pitner.

"Fertilizer Studies With Vegetables in Cameron County," Agr. Exp. Sta., Texas A & M, College Station, Texas, P. R. 1025, Aug. 16, 1946, B. S. Pickett.

"Distribution of Fertilizer Sales in Texas, January 1-June 30, 1946," Agr. Exp. Sta., Texas A & M, College Station, Texas, P. R. 1037, Sept. 19, 1946, J. F. Fudge.

"1946 Results of Plow-Sole Fertilizer Demonstrations in Wisconsin," Soils Department, College of Agr., Madison, Wis., C. J. Chapman.

"1946 Results of Fertilizer Demonstrations on Small Grain and Hay," Soils Dept., Univ. of Wis., Madison, Wis., C. J. Chapman.

"Consumption and Trends in the Use of Fertilizer in the Year Ended June 30, 1944," U.S.D.A., Washington, D. C., Cir. 756, Nov. 1946, A. L. Mehring, Hilda M. Wallace, and Mildred Drain.

Soils

"The Effect of Tillage on Soil and Moisture Conservation and on Crop Yields at Langdon and Edgeley and at Other Points in North Dakota," Agr. Exp. Sta., N. D. Agr. College, Fargo, N. D., Bul, 341, Aug. 1946, C. L. Englehorn.

"Progress Report on Tillage Methods in Preparing Land for Corn," Depts. of Agron. and Agr. Eng., Ohio Agr. Exp. Sta., Wooster, Ohio, Mimeo. 102, April 18, 1946, J. B. Page, C. J. Willard, and G. W. McCuen.

"Our Land, Its Conservation, Improvement, Best Use," Clemson Agr. College, Clemson, S. C., Cir. 286, June 1946.

"Soil-Moisture Studies Lead to Improved Cultural Practices," U.S.D.A., Washington, D. C., R.A.S. 65 (P) Aug. 30, 1946.

Crops

"Oats for Grain, Grazing, Hay," Ext. Serv., Ala. Polytechnic Inst., Auburn, Ala., Cir. 310, Rev. June 1946, J. C. Lowery.

"Plant Winter Legumes Where Peanuts Are Harvested," Ext. Serv., Ala. Polytechnic Inst., Auburn, Ala., Cir. 311, July 1945, J. C. Lowery.

"Vegetable and Herb Seed Production in Arizona," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., Bul. 204, July 1946, A. E. Griffiths, W. W. Jones, and A. H. Finch.

"Wheat, Barley and Rye Variety Trials in Arkansas," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Bul. 461, Feb. 1946, C. K. McClelland.

"1945 Arkansas Corn Yield Tests," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Rpt. Ser. 2, Jan. 1946, D. B. Shank.

"1945 Arkansas Rice Yield Tests," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Rpt. Ser. 3, Jan. 1946, C. R. Adair, L. C. Kapp, and E. M. Cralley.

"1945 Yields of Fall Sown Oat Varieties in

Arkansas," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Rpt. Ser. 4, Jan. 1946, W. J. Wiser, H. R. Rosen, and C. K. McClelland.

"Gardening By the Month," Ext. Serv., Colo. A & M College, Fort Collins, Colo., Ext. Bul. 386-A, April 1945, C. M. Drage.

"Preliminary Report of Green Grazing Versus Hays for Fattening Swine," Ga. Exp. Sta., Experiment, Ga., Cir. 152, Nov. 1946, Z. A. Massey and S. W. Fisher.

"Grafting the Avocado in Hawaii," Agr. Ext. Serv., Univ. of Hawaii, Honolulu 10, Hawaii, Ext. Cir. 211, Nov. 1946, William Bembower.

"Fifty-third Annual Report of the Idaho Agricultural Experiment Station," Agr. Exp. Sta., Univ. of Idaho, Moscow, Idaho, Bul. 268, July 1946.

"Value and Use of Tobacco Stalks in Farm Practice," Agr. Exp. Sta., Univ. of Ky., Lexington, Ky., Bul. 486, May 1946, M. E. Weeks and P. E. Karraker.

"A Twelve-Month Grazing Program for the Rice Area of Louisiana," Agr. Exp. Sta., La. State Univ., Baton Rouge, La., Bul. 407, Sept. 1946, R. K. Walker and M. B. Sturgis.

"Sixty-first Annual Report of the Maine Agricultural Experiment Station 1944-1945," Agr. Exp. Sta., Univ. of Maine, Orono, Maine.

"Progress Through Research, 58th Annual Report of the Agricultural Experiment Station 1944-1945," Univ. of Md., College Park, Md.

"Vegetative Propagation of White Pine," Agr. Exp. Sta., Mass. State College, Amherst, Mass., Bul. 435, July 1946, W. L. Doran.

"A Fast Way To Seed Hairy Vetch in Cotton," Agr. Ext. Serv., Univ. of Mo., Columbia, Mo., Cir. 533, July 1946, J. R. Paulling and Ralph Ricketts.

"Progress of the New York State Extension Service," N. Y. State College of Agr., Cornell Univ., Ithaca, N. Y., Ext. Bul. 699, July 1946.

"Research and Farming, 68th Annual Report, 1945," Agr. Exp. Sta., Univ. of N. C., Raleigh, N. C., P.R. 4.

"Better Tobacco Plants," N. C. Agr. Ext. Serv., State College Station, Raleigh, N. C., Ext. Cir. 293, Sept. 1946.

"Tree Ring Studies in North Dakota," Agr. Exp. Sta., N. D. Agr. College, Fargo, N. D., Bul. 338, April 1946, G. F. Will.

"Introduction and Spread of Weeds and Other Plants in North Dakota," Agr. Exp. Sta., N. D. Agr. College, Fargo, N. D., Bul. 339, May 1946, O. A. Stevens.

"Range Vegetation Studies," Agr. Exp. Sta., N. D. Agr. College, Fargo, N. D., Bul. 340, June 1946, W. C. Whitman and E. A. Helgeson.

"Gladiolus, Their Culture and Care in North Dakota," Ext. Serv., N. D. Agr. College, Fargo, N. D., Cir. A-92, Jan. 1946, H. A. Graves.

"The Ohio Corn Performance Tests: 1943 and 1944," Dept. of Agron., Agr. Exp. Sta., Wooster, Ohio, Sp. Cir. 71, Feb. 1946, G. H. Stringfield, R. D. Lewis, and H. L. Pfaff.

Science for the Farmer, 59th Annual Report," Agr. Exp. Sta., Pa. State College, State College, Pa., Bul. 480, July 1946.

"Pepper Variety and Strain Trials—1946," Agr. Exp. Sta., Pa. State College, State College, Pa., Paper 1335, Dec. 18, 1946, M. L. Odland.

"Sweet Corn Variety and Strain Trials—1946," Agr. Exp. Sta., Pa. State College, State College, Pa., Paper 1340, Oct. 1, 1946, M. L. Odland and C. J. Noll.

"Pea Variety and Strain Trials, 1946," Agr. Exp. Sta., Pa. State College, State College, Pa., Paper 1343, Oct. 23, 1946, R. E. Larson.

"Trials of Annual Flowers, 1946," Agr. Exp. Sta., Pa. State College, State College, Pa., Paper 1347, Nov. 15, 1946, E. I. Wilde and John R. Culbert.

"Tomato Variety and Strain Trials, 1946," Agr. Exp. Sta., Pa. State College, State College, Pa., Paper 1351, Dec. 9, 1946, M. L. Odland.

"Lima Bean Variety and Strain Trials—1946," Agr. Exp. Sta., Pa. State College, State College, Pa., Paper 1354, Dec. 13, 1946, M. L. Odland.

"Rutabaga Variety and Strain Trials—1946," Agr. Exp. Sta., Pa. State College, State College, Pa., Paper 1356, Dec. 17, 1946, C. J. Noll and M. L. Odland

"Sweet Potato Production Possibilities in South Carolina," Agr. Exp. Sta., Clemson Agr. College, Clemson, S. C., Bul. 364, April 1946, M. J. Peterson, G. H. Aull, E. W. Knobel, and J. C. Downing.

"The Cotton Contest—1944," Clemson Agr. College, Clemson, S. C., Cir. 267, Feb. 1945, H. G. Boylston.

"Small Grains in South Carolina," Clemson Agr. College, Clemson, S. C., Cir. 292, Oct. 1946, H. A. Woodle and W. H. Craven.

"Early Planted Treated Seed Produces Higher Sorghum Yields," Agr. Exp. Sta., S. D. State College, Brookings, S. D., Bul. 381, April 1946, W. F. Buchholtz.

"Alfalfa Strains for Middle Tennessee," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Cir. 94, Aug. 1946, J. B. Washko and J. A. Ewing.

"Panorama of Agricultural Research, Texas, 58th Annual Report, 1945," Agr. Exp. Sta., Texas A & M, College Station, Texas, C. H. McDowell.

"Vetch Improves Soil Fertility in East Texas," Agr. Exp. Sta., Texas A & M, College Station, Texas, P.R. 1024, Aug. 8, 1946, E. B. Reynolds and J. C. Smith.

"Austin Wheat," Agr. Exp. Sta., Texas A & M, College Station, Texas, P.R. 1027, Aug. 23, 1946, I. M. Atkins and E. S. McFadden.

"Factors Influencing Cotton Harvesting Methods on the High Plains," Agr. Exp. Sta., Texas A & M, College Station, Texas, P.R. 1029, Aug. 27, 1946, D. L. Jones and H. D. Lynn.

"Grasses for Greater Production in Wash-

ington," Ext. Serv., State College of Wash., Pullman, Wash., Cir. 81 (Rev.), Sept. 1946.

"Clovers for Greater Production in Washington," Ext. Serv., State College of Wash., Pullman, Wash., Cir. 83 (Rev.), Sept. 1946.

"Grasses for Greater Production in Washington: Seeding Grasses and Legumes," Ext. Serv., State College of Wash., Pullman, Wash., Cir. 104, Sept. 1946.

"Data on Weather from 1924 to 1945 at the Irrigation Branch Experiment Station, Near Prosser, Washington," Agr. Exp. Sta., State College of Wash., Pullman, Wash., Bul. 473, April 1946, C. Emil Nelson.

"The Fruit Orchard in Wyoming," Agr. Ext. Serv., Univ. of Wyoming, Laramie, Wyo., Cir. 58 (Rev.), March 1945, W. O. Edmondson.

"Report of Cooperative Extension Work in Agriculture and Home Economics, 1946," Ext. Serv., U.S.D.A., Washington, D. C., Oct. 15, 1946.

Economics

"Land Tenure in Arkansas: IV. Further Changes in Labor Used on Cotton Farms, 1939-44," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Bul. 459, Aug. 1945, O. T. Osgood and J. W. White.

"Twenty-first Annual Report of the Farm Bureau Farm Management Service, 1945," Dept. of Agr. Econ., Univ. of Ill., Urbana, Ill., AE-2389, May 1946, M. L. Mosher and F. J. Reiss.

"Complete Costs and Farm Business Analysis on 24 Farms in Champaign and Piatt Counties, Illinois, 1945," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., AE-2410, Aug. 1946, R. H. Wilcox, J. R. Harris and A. C. Ruwe.

"An Economic Study of the History, Status and Operation of Agricultural Cooperatives in Indiana," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., Bul. 518, 1946, T. L. Canada and E. H. Matzen.

"Costs, Returns, and Practices in Producing Tobacco in Jefferson County, Indiana," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., S.B. 519, 1946, F. V. Smith.

"Suggested Adjustments in Kansas Agriculture for 1947," Kans. Agr. Exp. Sta., Manhattan, Kans., Agr. Econ. Rpt. 30, Aug. 1946.

"Problems Pertaining to Farm Real Estate Assessment as Reported by County Assessing Officers," Kans. Agr. Exp. Sta., Manhattan, Kans., Agr. Econ. Rpt. 31, Oct. 1946, N. J. Anderson, Harold Howe, and W. H. Pine.

"The Operators' Cost of Producing Some Field Crops in Central Missouri," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Res. Bul. 399, March 1946, B. H. Frame.

"Some Effects of the War on Rural Life in Missouri, 1939-1945," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Res. Bul. 401, April 1946, Gerard Schultz.

"Looking Ahead With Montana Farmers and Ranchers," Ext. Serv., Montana State College, Bozeman, Mont., Cir. 170, July 1946, H. R. Stucky and H. G. Halcrow.

"Looking Ahead With Montana Farmers and Ranchers, Farm and Home Topics," Ext. Serv., Mont. State College, Bozeman, Mont., Cir. 171, Oct. 1946, H. R. Stucky and H. G. Halcrow.

"Wartime and Peacetime Farming in South Carolina, 1945," Clemson Agr. College, Clemson, S. C.

"The Utah Price Situation," Utah Agr. Exp. Sta., Logan, Utah, Mimeo. 330, Sept. 29, 1946, W. P. Thomas

"The 1947 Agricultural Conservation Program for: WR 47-1, Ariz.; WR 47-1, Calif.; WR 47-1, Colo.; WR 47-1, Idaho; WR 47-1, Kans.; NER-1110-Mass.; WR 47-1, Mont.; WR 47-1, Nev.; NER-1110, N. H.; NER-1110, N. J.; New Mexico; WR 47-1, N. D.; NER-1110, Pa.; NER-1110, R. I.; WR 47-1, Utah; NER-1110, Vt.; WR 47-1, Wash.; WR 47-1, Wyo.," U.S.D.A., Washington, D. C.

"The 1947 Handbook of Conservation Practices for: ECR-1101, Del.; ECR-1101, Md.; ECR-1101, N. C.; ECR-1101, Tenn.; ECR-1101, Va.; ECR-1101, W. Va.," U.S.D.A., Washington, D. C.

"Purchasing Hybrid Seed Corn Cooperatively," Farm Credit Admin., U.S.D.A., Washington, D. C., Misc. Rpt. 100, Aug. 1946, T. E. Hall.

"World Rice Production and Trade," Office of Foreign Agr. Relations, U.S.D.A., Washington, D. C., Foreign Agr. Rpt. 15, Oct. 1946, F. J. Rossiter, L. Thelma Willahan, and W. E. Cummings.

"Agricultural Outlook Charts," U.S.D.A., Washington, D. C., Book 1, Oct. 1946.

"Citrus: Estimates of Production and Utilization, 1943-44 to 1945-46," Bu. of Agr. Econ., U.S.D.A., Washington, D. C., Oct. 1946.

"United States Tariff Rates on Agricultural Products (Rev.)," Bu. of Agr. Econ., U.S.D.A., Washington, D. C., Aug. 1946, C. F. Wells.

LAST CHANCE

They had searched in vain for a hotel room. "Well, mother," he said, "I guess we'll have to sleep in one of those night clubs, even if they do charge $5 for covers."

Johnny: Pa, is it wrong to say cofferdam?

Pa: No, my son. Why?

Johnny: Well, the other day our old cow got choked on a turnip and I thought she'd cofferdam head off.

Fifty-One Bushels Difference

As much as 51 bushels of corn per acre are lost each year by the farmer who uses inadequate fertilizer and checks his corn on rolling land. The principal thief is the runoff from the watershed carrying soil and fertilizing elements.

A study of these losses from runoff and the influence of conservation practices is being made by the Purdue University Agricultural Experiment Station and Soil Conservation Research Division at the Throckmorton farm, south of Lafayette.

In 1945, corn watersheds that were contour-cultivated and had 900 pounds of 8-8-8 and six tons of manure plowed under yielded more than during any of the three previous years, indicating that the beneficial results as measured by crop yields accumulate. The corn yield from the contoured field was 122 bushels while the yield from the adjacent watershed was 71 bushels or a difference of 51 bushels. The comparative yields in 1942, the first year that conservation farming methods were used on the one field, were 92 and 67 bushels respectively in favor of the conservation methods.

The story of the disappearing crops is told in figures giving the amount of soil washed away on the comparative fields. Last year the total of solids lost from two watersheds in corn check-seeded and fertilized with 150 pounds of 0-14-7 per acre was three and one-half tons per acre.

Nitrogen losses were likewise more than six times as great on the untreated as on treated watersheds. This explains in part the lower yields, as crop yields are often limited by the lack of nitrogen during critical growing periods.

Mechanized Farms Expand

In farm mechanization there has been the double problem of fitting the machine to the farm and of fitting the farm to the machine. Some farm machines have been getting smaller. For example, many modern combines are midgets compared with the early horse-drawn combines built for the "bonanza" wheat farmers. In general, however, U. S. farms are growing in size to fit the machines, Elco Greenshields of the Bureau of Agricultural Economics says in an article, "Farms Are Getting Larger and Fewer," in *The Agricultural Situation*.

On farms still operated by a family —a father or a father-and-son combination—mechanization favors a larger farm because the same work force can care for more acres. Also, if mechanized labor saving is to be economical, the machine must be kept working enough to pay its way. The family-sized farm, also, is forced into competition with the farms of larger acreage which mechanization has made possible as commercial ventures. Such information helps account for some of the following highlight facts from this article.

"The average farm for the country as a whole is now 50 acres larger than 25 years ago, 20 acres larger than five years ago. In the Midwest, where extreme sizes are less numerous, the average farm has increased about 30 acres in 25 years."

"Today, over half of the farm land in the country is in farms of over 500

acres, compared to only a third in 1920. And farms over 1,000 acres now account for 40 per cent of the farm land compared with less than a fourth 25 years ago.

The number of 100-acre to 180-acre farms decreased by over 110,000 during the war.

"The census would show an even more pronounced trend toward larger farms if the very small units—those under 10 acres and for the most part not much more than rural residences for city workers—were not included in the total. The number of those so-called farms has increased over 300,000 since World War I, nearly 90,000 in the past five years."

Large Grasses for Pasture

(*From page* 14)

hay crops. Orchard grass is reputed to be better adapted to infertile soils than timothy. Since the fertility in our plots has been equal, we cannot judge as to this factor. We do know it is very compatible with ladino and resists incursions of volunteer grasses better than brome and much better than rye grass. It makes as much growth in the heat of summer as smooth brome and more than timothy. It should not be seeded on wet, cold soils since it will be ready to graze or may even be headed out before the land is ready for the trampling of the animals. If it does "head out," the seed will spread and infest other nearby areas. The biggest weakness of orchard grass is that it can be overgrazed in late fall to the point of killing out. It appears to be necessary for it to go into the winter with some growth which is indicative of root reserves. On the other hand, fairly close grazing early and until September first is desirable, with management, of course.

Reed Canary grass has long been recognized as being very well adapted to wet land. In our trials, it has been seeded on well-drained soils, where it has proved to be both hardy and drought-resistant. It lacks palatability, however, and unless closely grazed competes too much with ladino. Like orchard grass, reed canary resists the incursion of other grasses. Our impression of reed canary in these trials has been that it looks better than it really is and that a clipping or harvest as we make it does not bulk up or weigh up as it does on a similar growth with the other grasses. Its use should probably still be confined to wetter areas which may be too wet for ladino and other clovers, but where it will undoubtedly do better than its mates in these trials.

Perennial rye grass has proved to be the least hardy of any of these grasses and has been too quickly supplanted by Kentucky blue and bent grass in our tests. Perhaps new varieties will be developed to overcome this fault. Until they are, we would favor seeding this grass in a complex mixture with other grasses rather than singly with clovers. The grass is palatable and ladino appears to do well with it. It has long been the chief pasture grass of northern Europe and the British Isles where it is very highly regarded. Measured by our yardsticks, it does not rank as high as its virtues abroad would appear to indicate.

Tall Fescue has maintained itself somewhat better than the other grasses in this test. Part of this may be due to its lack of palatability, part to its decumbent habit of growth. This habit causes the leaves at the crowns of the plants to lie flat on the ground and for that reason they are difficult for the animals to browse closely. It is the

best yielder of all these grasses in late fall and apparently this factor coupled with its resistance to grazing allows it to persist. Ranking below orchard grass and reed canary in palatability, probably because of the harshness of the foliage, it isn't likely that tall fescue will achieve the importance that its persistence and yielding ability would deserve. These virtues speak well for its inclusion in conservation programs in which the emphasis is placed upon soil cover rather than palatability and grazing value.

Yields Tell the Story

(*From page* 26)

southern county are growing crimson clover, lespedeza, velvet beans, soybeans, cowpeas, and rye for grazing, soil improvement, hay, and seed. They are planting corn, grain, and hegari to feed livestock and provide food for the family. They are producing wheat for feed and home use. They are seeding five to seven bushels of small grain and legume mixture per acre for fall and winter temporary grazing. County Agent Shores urges heavy fertilization of corn and advises larger acreage of hybrid corn which brought excellent yields in 1944 and 1945. The Farmers Bank of Monroe sponsors annually a five-acre corn contest.

Soil erosion control, as point number ten, is well established in the county. This has been accomplished through terracing, use of sericea and kudzu, definite plans of crop rotation, reforestation, and sericea border strips around fields and woods.

Without sufficient acreage in permanent pasture (point number eleven), the tremendous increase in livestock income would have been difficult. Mowing of pastures at least three times a year to control weeds is advised.

Point number twelve in Walton's dozen-barreled farm planning is one that the rest of Georgia and the nation are watching closely. It concerns health. Walton was one of six counties in the United States elected by the Inter-Bureau Committee on Postwar Program of the U. S. Department of Agriculture in 1942 to conduct an experimental rural health program. Last year 673 families received medical care through this health association which is non-profit and designed to administer medical care at low cost.

Sums up County Agent Shores, with Home Agent Miss Holbrook in agreement: "Progress made by the farm people in the development of their farms and homes and in the development of cash crops since 1938 clearly indicates that Walton farm families are following the agricultural program recommended by their Program Planning Committee."

And as Editor Camp observes in his weekly newspaper: "The boy on many a farm will not be content with the livelihood provided by cotton yields of 250 pounds or corn crops of 10 bushels to the acre."

Walton County, however, is keeping most of its farm boys at home by growing more commodities on fewer acres—a situation that is providing land for so many uses: crop rotation, soil conservation practices, permanent pasture, reforestation, and others that will add to the ultimate income. You don't have to ask Walton County farmers if a planned agricultural program pays. They've already proven it.

It ain't the school Mary hates, it's the principal of the thing.

A perfect gentleman makes every other man in the room uneasy.

Time is the greatest healer, but he's certainly no beauty specialist.

Fertilizers and Human Health

(*From page* 18)

bon, the key element in organic matter, was in the atmosphere as carbon dioxide. In due time primitive forms of life came into existence. Only through these, and the higher forms of plant life that evolved from them, was the inorganic carbon of the atmosphere combined with water, air, and soil to form organic matter. Animals made use of the organic matter that had been manufactured by plants but they did not construct organic matter from its primary constituents.

The validity of Liebig's concept has been verified in many plant physiology greenhouses. Luxuriantly perfect crop plants are being widely grown to full fruit production on mineral salts dissolved in distilled water. Soil-less plant culture is now being practiced on a large scale for commercial purposes. It consists in dissolving the necessary chemicals in water and allowing this water to flow through beds of sand, gravel, cinders, or other similar inorganic materials that provide standing room for the plants while they are being fed. The beds contain no humus and no earthworms. Plants grown in this manner are equal in size and appearance to those in the field. Selected seed produced by these plants yield identical plants generation after generation.

Fertilizers Designed From Plant Ash

Analyses of plant ash were the starting point in finding out how to formulate the fertilizers required to replace the elements consumed by plants. It is conceivable that animals need a larger number of elements than is contained in fertilizers. Two schools of thought exist as to what should be done about minor-element deficiencies in food and feed. One group insists that these extra elements be added to the soil so they can be built up into plant tissue and thus, hopefully, become more useful to animals and man. The others believe that the need for extra mineral elements can best be met by adding traces of them to common salt. It is now standard practice to add iodine to salt as a preventive for goiter. In some areas livestock are being fed cobalt sulfate as a cure for anemia. Manganese sulfate is being used as a remedy for slipped tendons in poultry. Large amounts of limestone and phosphate are fed to milk cows to insure adequate bone development.

Organic Matter Has Real Value in Soil

Although one can grow perfect plants in the complete absence of organic matter this does not argue against encouraging greater attention to soil organic matter in agricultural practice. What is being aimed at is to separate facts from fancies so that intelligent consideration can be given to the perplexing problems with which the soil conservationist has to deal.

It is now generally agreed that organic matter has value in the soil because:

1. It aids in the control of soil erosion by wind and water, whether in the form of growing roots, the crude residues of plants, or as humus.
2. It serves as food for various types of desirable soil microorganisms, including the non-symbiotic types that fix atmospheric nitrogen.
3. It contains major and minor mineral elements that were left behind in plant residues and can be reused by the crop that follows.
4. It improves the physical qualities of both light and heavy soils.
5. It aids, in mulch form, in preventing loss of water by evaporation and in the regulation of soil temperature.

Many other more or less obscure val-

ues can be assigned to soil organic matter, not excluding the possibility of its release of plant-stimulating hormones during decay or of their production by the soil microorganisms that bring this about. It is at this point that the scientist sees "through a glass darkly" but tremendous possibilities exist for the untrammeled imagination of the charlatan.

Organic Matter Grown with Inorganic Fertilizers

It has been repeatedly demonstrated that one of the most effective means of adding organic matter to the soil is by the intelligent use of purely inorganic fertilizers. In an experiment at the West Virginia Agricultural Experiment Station * it was shown that five tons of fertilizer per acre over a period of 15 years not only multiplied the yield by three but increased the soil's organic matter 50 per cent.

Some 30 years ago the Director of the Ohio Agricultural Experiment Station pointed out that the second highest authenticated long-continued yield of wheat ever produced was 33.5 bushels per acre. This was the 74-year average for the annually-manured, continuous-wheat plot on the Rothamsted Experiment Station Farm in England. But a plot alongside that had never received anything but chemical fertilizers during this same period averaged one bushel more.

Fertilizers Stay the Hand of Famine

The essential plant-food elements are in continuous circulation from air to plant to air and from soil to plant to soil, sometimes by way of the animal and sometimes not. During this process a part is lost to the sea by way of drainage and sewage waters. Agriculture speeds up the rate of circulation of the elements and, in so doing, speeds up the rate of loss of elements to the sea. The lime and fertilizer industries fulfill highly essential functions in restoring these losses by bringing the essential elements back from ancient seas. They also aid the plant in recapturing the nitrogen that escaped back to the air. A limited population may get along fairly well without these industries, a larger population may continue to exist, but an ever-growing and thriving population such as we enjoy in the United States must have their help. Millions of people die from starvation every year in the Orient where practically no fertilizers are used, and many more millions go to bed hungry every night of the year.

No Cure for Old Age in Man

Man has been subjected to many hazards in the evolutionary process. Many of these hazards still remain to be dealt with. Marett* concluded that the first man originated in an area of iodine deficiency as a result of which he lost the hair of his simian ancestors. Metchnikoff ** thought many of man's ills grew out of the toxins that developed in his large intestine, an obsolete organ that failed to evolve as rapidly as man himself. Many other highly intelligent scientists have devoted their lives to one or another phase of this problem. Cowdry *** assembled a 936-page volume that dealt with all the known facts about the aging of man, but he could not put his finger on a primary cause.

It is believed that the field of nutrition offers the most promising line of attack in extending the lifespan of man. As previously pointed out, a deficiency of one or more of the minor elements or a lack of balance in those of the major group of fertilizer elements may be responsible for part of his troubles. But few of the people of the United States eat the produce of just one soil. Such rapid advances have been made in

* Residual Effects of Fertilizers, West Virginia Agr. Exp. Sta. Bul. 160, 1916.

* Race, Sex, and Environment. The Chemical Publishing Company, Brooklyn, 1936.

** The Prolongation of Life. G. T. Putnam and Sons, New York, 1910.

*** Problems of Aging. Williams and Wilkins Company, Baltimore, 1942.

methods of transportation that most of us are now the product of the soils of the whole earth. Any lack in the produce of one could conceivably be made up by an abundance in the produce of some of the others.

No doubt there is some connection between fertilizers and human health, and the fertilizer industry would do well to finance an extensive research program to study this problem. A one-sided fertilizer program could lead to human disaster, just as an up-and-down-hill plowing program with a tractor would lead to land ruin. But just as the tractor is a powerful weapon for good when employed to construct terraces on the contour, so fertilizer, when rightly used, permits of working wonders with the soil, not only in terms of the quantity but also of the quality of the crop that is produced.

It seems probable that what appears to be an increasing tendency toward degenerative diseases in this country is merely an outgrowth of the great improvement in the control of the diseases of youth. In proportion as more of the youth survive, more people live to be 60 or 70 and a larger number are caught by the diseases of these older ages. But whether at 5, 50, or 150, men die, if not from one cause then from another. Death may be delayed but, in so far as is now known, it is inevitable.

Research Points the Way...in North Carolina

(*From page* 10)

was increased from 42 bushels with no phosphate to 57 bushels where 40 pounds of P_2O_5 per acre were applied. No yield increase was obtained from higher phosphate applications.

Early vegetative responses to phosphate application were also found in Coastal Plain soils which contained as much as 58 p.p.m. of soluble phosphorus. However, yields were not increased by phosphate fertilization. Adequate nitrogen and potash applications were used in phosphate comparisons.

Nutrient Balance Important

The need for nutrient balance was shown clearly in the experiment on the Dunbar soil. There was a striking yield response to nitrogen at the high potash level and no response to nitrogen when no potash was applied. Likewise, there was a marked yield response to potash at the high and intermediate nitrogen levels, but no response to potash when 0 or 20 pounds of nitrogen per acre were applied.

Winter Legumes Furnish Nitrogen

Figure 4 shows the effect of a good growth of Austrian winter peas on corn yields with and without additional nitrogen. The yield increase from winter legumes in plots where no additional nitrogen had been added was about 40 bushels per acre. At turning time there was a solid cover of Austrian winter peas about one foot high which amounted to 2,100 pounds per acre of air-dry top growth which contained about 56 pounds of nitrogen per acre. The corn yield increase from this legume growth was about the same as that obtained from 60 pounds of chemical nitrogen per acre.

In the plots where 60 pounds of nitrogen were applied in addition to that furnished by the winter legume, an additional 20-bushel-per-acre increase was obtained. These data indicate that

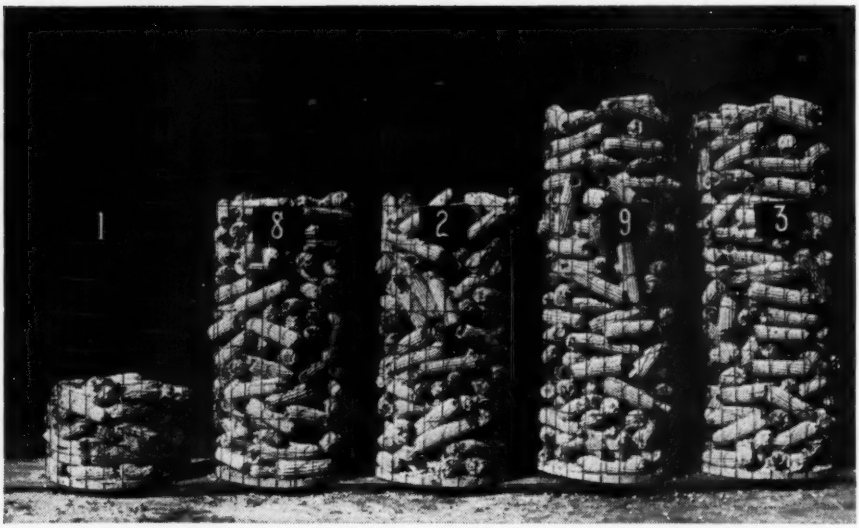


Fig. 4. Corn taken from plots receiving 0, 0 plus Austrian winter peas, 60, 60 plus Austrian winter peas, and 120 lbs. nitrogen per acre on a Norfolk fine sandy loam, C. H. Parker farm, Johnston County. The yields were 17, 58, 59, 79, and 78 bushels per acre, respectively.

winter legumes furnish a substantial quantity of nitrogen for corn production but that supplemental nitrogen is necessary to produce maximum yields.

Nitrogen Boosts Protein in Grain

Nitrogen applications had marked influence on the protein content of the corn grain in all 25 of the experiments conducted in 1944 and 1945. The magnitude of increase in protein was usually the greatest where the yield response to nitrogen was lowest and vice versa. This relationship is shown in

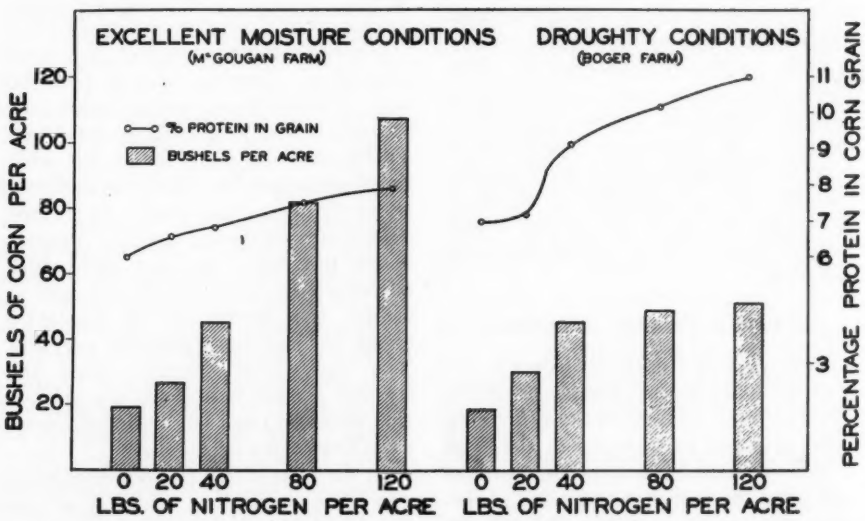


Fig. 5. The effect of nitrogen application upon corn yields and percentage protein in the grain under excellent moisture conditions at the J. M. McGougan farm, Hoke County, and under conditions of a June-August drought at the M. G. Boger farm, Davie County, in 1944.

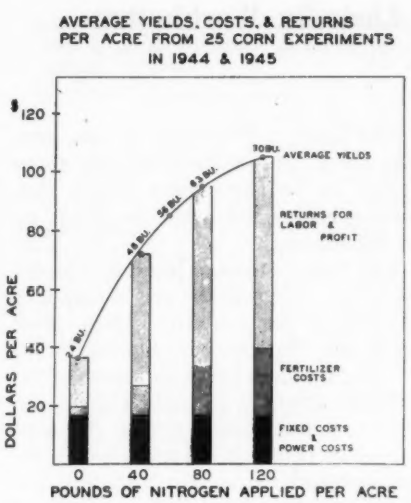


Fig. 6. Returns in dollars from average yields of 25 corn experiments. Values are figured at 1944 and 1945 prices (corn $1.50 per bushel, labor 30¢, mule power 22¢ per hour). Fertilizer cost includes cost of nitrogen applied plus cost of one and one-half times the phosphoric acid and one and three-fourths times the potash removed by the corn yields. (Corn prices, fixed costs, and labor cost figures were obtained from Agricultural Economics Department). Power, labor, and equipment costs are all based on mule operation and hand harvesting. These costs have been found to be considerably less on mechanized farms.

figure 5. Under the excellent moisture condition the yield response to nitrogen was exceptional and the increase in protein percentage was relatively low. However, under the droughty condition yields were increased only 31 bushels. Further yield increases were limited by a lack of moisture, but the protein content continued to increase. In the Edgecombe County experiment (figure 2) there was no yield response beyond the 120-pound nitrogen application. However, the protein percentage was substantially increased by an additional 40-pound nitrogen application. Leaf disease which occurred at the late roasting-ear stage destroyed much of the leaf tissue and apparently retarded further carbohydrate manufacture, while nitrogen uptake and protein synthesis continued.

The nitrogen content of corn grain varied from a low of 0.92 per cent to a high of 1.99 per cent, or an approximate range or 5.8 per cent to 12.5 per cent protein. Although corn is not sold for its protein content, it does seem that it should receive some consideration. Certainly substantial amounts of high-priced protein concentrates could be saved when hogs or poultry are fed corn containing 11 to 12 per cent protein as compared to corn with 6 to 7 per cent protein.

Costs and Profits

The average corn yields, the fixed costs, fertilizer costs, and returns for labor and profit obtained in the 25 experiments conducted in 1944 and 1945 are shown in figure 6. Since fixed costs and power costs per acre are almost constant, the data indicate that the greatest potentiality for profits in corn production came with adequate fertilization and high-per-acre yields. Thus with a moderate investment in fertilizer the farmer can produce his feed requirement on fewer acres and with less labor and greater profit.

Summary

The development of adapted corn hybrids through breeding research combined with the research findings on corn fertilization and culture offers an opportunity for the North Carolina farmer to greatly increase his corn yields. It should be emphasized that the farmer should use close spacing and avoid deep or late cultivation of his corn if he is to make most effective use of the yield potentiality of his improved soil fertility and adapted corn hybrids.

Salesgirl: "Yes, Mrs. Jones, our girdles come in four fixed sizes—small, medium, wow, and holy mackerel!"

Real intelligence is like a river—the deeper it is the less noise it makes.

Potash Pays for Peas at Chehalis, Washington

(*From page* 24)

leaves and stipules from the two areas, the samples from the Chehalis area averaging around one per cent while the average from the Puyallup area was over two per cent. In order to check the data more closely pea samples were taken from experimental pea plots in both areas in 1945 and separated into leaves, stipules, petioles, and stems. Table 6 shows the percentage potash in the various plant parts sampled at the full bloom stage.

The potassium analyses of both years (1944 and 1945) check quite closely and show a close correlation with the yield data presented earlier in this paper.

Since these preliminary studies showed some promise of indicating the nutrient status of the various soil types in Western Washington by using the pea plant as an absorbing medium, an elaborate study was undertaken in 1946. The data will be reported in another paper.

A brief summary of the pertinent data is listed below:

(1) The best time for a single sampling appears to be approximately two weeks before full bloom. If two samples are to be obtained the best times appear to be two weeks before blossoming begins and when the plants are in full bloom.

(2) Results to date indicate that the stems or the petioles are satisfactory plant parts for analysis. These plant parts are illustrated in figures 1 and 2. The leaves are also indicative of the nutrient status of the soil as has been shown, but they do not have the wide ranges of potash content present in the petioles and stems. In addition, further unpublished data seem to indicate that the petiole and stems are the best plant parts to sample for available phosphorus, thus enabling a single plant part to serve for both analyses.

It is hoped to undertake a survey of all the pea-growing areas in Western Washington in 1947 to ascertain the levels of phosphorus and potash by these methods. After the areas have been surveyed, field plot studies will be carried out in the various deficient areas to determine fertilizer requirements.

TABLE 5: POTASSIUM CONTENT OF LEAVES AND STIPULES FROM RANDOM PLANT SAMPLES TAKEN IN THE PUYALLUP AREA IN 1941.

Grower	Stage of plant growth	Per cent K	
		Leaves	Stipules
Experiment Station	Blossoms	1.90	1.91
Experiment Station	Pods ¼ formed	1.94	2.06
Experiment Station	Pods ¼ formed	2.02	2.10
Experiment Station	Pods ¼ formed	2.02	2.02
Experiment Station	Pods ¼ formed	2.07	2.07
Experiment Station	Blossoms	2.21	2.29
Experiment Station	Blossoms	2.41	2.53
Experiment Station	Blossoms	2.50	2.68
Experiment Station	Blossoms	2.53	2.66
Experiment Station	Blossoms	2.57	2.49
	Average	2.22	2.28

TABLE 6: POTASSIUM CONTENT OF LEAVES, STIPULES, PETIOLES, AND STEMS OF PEA PLANTS SAMPLED AT FULL BLOOM STAGE FROM THE PUYALLUP AND CHEHALIS AREAS IN 1945.

Fertilizer*	Puyallup—Sultan silt loam				Chehalis silty clay loam			
	Leaves	Stipules	Petioles	Stems	Leaves	Stipules	Petioles	Stems
0-20-20 (Rock)†	2.15	2.24	1.86	1.89	1.17	1.30	1.05	0.87
Check	2.33	2.40	1.83	1.83	0.73	0.82	0.54	0.58
5-20-0	2.09	2.33	1.68	1.73	0.90	0.90	0.57	0.64
5-20-20	2.20	2.46	1.87	1.77	1.05	1.17	0.87	0.79
0-20-20	2.12	1.99	1.70	1.80	1.13	1.35	1.08	0.87
0-20-0	2.32	2.32	1.62	1.71	0.87	0.90	0.54	0.60
Average	2.20	2.29	1.76	1.79	0.98	1.07	0.78	0.73

* Figures based on 300 lbs. 5-20-20 fertilizer.
† All phosphate supplied by rock phosphate.

Home Town of Heroes

(*From page* 5)

IT is reliably said by Alexandrians that Christ church was built and paid for with Oronoco tobacco, in which form of exchange the contractors were reimbursed. The first rector of this parish was also paid in tobacco, receiving 7,280 pounds of this leaf for his services plus 1,000 pounds extra to meet his living quarters.

In his diary, Washington records attending church mostly at nearby Pohick parish prior to the Revolution, and afterwards he and his family were generally in attendance at the Alexandria church. Here he bought a pew for 36 pounds, 10 shillings, noted on a fly leaf of his day book.

Frolic, sports, and serious business occupied the famous General upon his return to private life in 1783 after resigning his commission. From his diary comes this notation, October 10, 1786: "At Alexandria in company with Major Washington and Mr. Lear; went to see the Jockey club purse run, dined by invitation from the members of same, and returned home in the evening."

Shortly thereafter when the proposed constitution had been ratified by Virginia and New Hampshire, Alexandria citizens staged a big rally for general rejoicing. Describing the event in a letter to Charles Pinckney, Washington concluded with this observation: "The people of Alexandria in this meeting constituted the first company in America to gather in public to pour a libation to the prosperity of the ten states that had actually adopted the general national government. The day has been memorable. I have just returned from assisting at the entertainment."

Upon being formally notified of his election as president, he set out on a journey full of ovation all the way from Mt. Vernon to New York. First, however, he must pause enroute for a testimonial dinner in Alexandria with an address by Dennis Ramsay, the mayor. In closing the mayor exclaimed, "Farewell, go and make a noble people happy."

Only a few years were left for the General to enjoy the bucolic scenes and village frolics on his retirement from public life. On his last birthday he spent a few hours amid old friends in Alexandria and watched maneuvers by the Uniformed Corps and took in an elegant ball at Gadsby's Tavern later. He did no dancing himself, however, as he said his dancing days were over. The balcony where the

musicians played that night and the woodwork trim in the ballroom were removed a few years ago and taken to the Metropolitan Museum in New York.

This hostelry on Royal Street, or part of it, was erected in 1752 and in 1793 the structure was bought by John Gadsby and wife, who made it a favorite spot for travelers and townsfolk. Many of the best public events in the General's career, from the Braddock campaign to his last review of the Independent Blues a month or so before his death, were at this Tavern. Not only were the military balls in honor of his birthday celebrated here, but even prior to the war of liberation many similar celebrations were staged here to honor the natal day of the British monarch. Admiral John Paul Jones was a frequent guest also, and amusing anecdotes are rife about some of his eccentric tricks and convivial jests.

ONE more noteworthy incident remains as a reminder of how much the General looked to the future. Old Alexandria Academy which is still a landmark and a spot for youthful games was built through private funds. In colonial times it was strictly a private school, except that General Washington managed to have it specified that one room in the building must be set aside for use as a public school room, and some say this was the very first such educational institution in America.

The quaint old town is full of noteworthy types of colonial architecture. Its doors and windows and some of its mantels are said to be masterpieces. It is not generally known that the Brothers Adam were among the pioneers of Alexandria. J. Adam was a noted silversmith while R. Adam was a cabinet maker and wood designer. His famous interior trim-work influenced American architecture and furniture design for many years and is prized today.

The town has been the home of countless famous people, partly because of its own charm and leisurely way of life, and partly owing to its nearness to the Nation's Capital. Two of the natives who reached fame were Charles Callahan, historian and Masonic leader, and Florence Crittenden Barrett —the lady who established a number of boarding homes for women and girls, known as the Florence Crittenden homes. Today numerous artists and writers reside there. Two well-known characters much in the public eye who claim this town as theirs are Judge Hugo Black of the Supreme Court and Archibald McLeish, former librarian of Congress.

Between the close of the War Between the States and World War I the town fell into somnolence and decline. It enjoyed a brief revival in the 1917-21 period and then drew back into its shell again. But since the Jap attack of 1941 thrust us again into conflict a rush of war work, army post services, and government residences resulted in a wave of increased activity. Today the town has a population of more than 75,000 and is a separate chartered entity with no "county" allegiances.

AS one looks across the broad Potomac river in its winding course past Alexandria, where it is a trifle over a mile in width, one is not apt to realize that this town once boasted the second most thriving shipping port and ship building yards in the country.

At the outbreak of the Revolution her shipyards and ship carpenters were asked to speed up their efforts to assist the Colony and her heroic General. In 1776, famous year of Independence, two galleys were built there, each manned with fourteen guns and a crew of ninety-six men. The building was supervised by an old friend and social associate of the General, none other than George Mason of Gunston Hall. With the feeble Government hard-pressed for funds and with its ragged soldiers in need of all the fighting

spirit that Tom Paine could coax into them, it was finally necessary for some of the Alexandrian Scotchmen to dig into their own purses to foot the shipbuilding project. How that must have hurt them!

BY summer of 1781 the British flotilla sailed up the quiet river, stopping long enough to take on food and refreshments seized at Mt. Vernon itself. It seems that this insult was a bitter pill for the absent General. His distant cousin, Lund Washington, was caretaker. In a right smart reproving letter the General later told Lund what he thought of his behavior, saying that it was bad enough to yield to the enemy that way, but simply terrible and disgraceful for him to board their vessels and converse with them. "This communing with scoundrels may become a subject for animadversion," wrote the wrathy hero to his relative.

Meanwhile the doughty defenders of Alexandria relied too much for protection upon two twelve-pounders to be mounted on traveling carriages and moved into a place of safety if a superior force of navy crewmen attacked the town. Except for some raids by privateers and a few bold threats to sack and burn the town nothing eventful happened after all.

The *Gazette* files bore many woodcut engravings of full-masted schooners with full sail to windward as decorative headpieces for the current nautical news. They reported the arrival in 1783 of "The Hunter," built in the local yards for direct trade with Russia, arriving with a cargo of iron, cordage, and canvas. John Ladd announced the coming to port of "the Genera," loaded with plaster of paris, cordage, and smoked herring. Other vessels advertised to take freight or charter to all European waters and the ports of the Indies.

Other ports of entry besides Alexandria in those days were at Norfolk, Bermuda Hundred, Tappanhannock, Yorktown, and such ocean towns along the Virginia coastline. Captains and crews from Alexandria sailed with full cargoes of flour, bread, shingles, tar, slate, barrel staves, and tobacco. The port was a place of call for mariners needing repairs. Some remnants of this old-time glory remain along the steep streets which lead to the river, a few of the rough lanes being still paved with the cobblestones put there by interned Hessian prisoners of war.

Vicious struggles with smugglers who sneaked in cargoes of rum and other goods were noted in the news columns. The town appointed an official searcher whose duty it was to board and seize all vessels that violated the port regulations. It transpired that a few of the town worthies were themselves in league with the smugglers and after a series of shady events, fines were levied upon sundry offenders among the local gentry and a few of them were beaten by the masked populace—a sort of repetition of the exploits of Paul Revere and his tea-party gang.

During the war with France, which was never officially declared, the Revenue Marine was organized. In one of the encounters with the enemy a local ship was lost. But later on in the War of 1812-14, the English fleet set siege to the town and after some Scotch deliberation, the mayor and his selectmen surrendered. Besides taking away some good craft of seaworthy quality, the enemy fined the town 16,000 barrels of flour, 1,000 hogsheads of tobacco, 150 bales of cotton, and lots of wine.

Twice since the early days faded to a memory have these old shipyards come to life again. Once during World War I, when Jones' Point echoed to the sounds of riveters and clash of steel, and recently with the erection of the Naval Torpedo Station for armament during World War II, have the traditions been revived to good purpose and without surrender.

AND so life proceeds amid a blend of hallowed memory and ancestor worship, sacred landmarks and vener-

ated traditions, mingled with the zip and zest of modern youth and up-to-date contrivances—a most interesting place to visit and a hard place to forget.

Some of its sidewalks are not easy to navigate even in the sunlight, with big root waves thrust across them from adjacent ancient sycamores, and with the edges strewn with loose bricks escaped from their moorings. Some of the stores along the principal thoroughfare have all the mellowness attributed to their age and respectable history. It is pointed out without much chance to doubt it that there are at least sixty business houses between the river and the Washington Masonic Memorial on Shooter's Hill that were built before 1830. If you find a floor wobbly and uneven or a sill leaning crazily, better not shout too loud about it because that's part of the most treasured local color.

Those fortunate enough to have automobiles may find a wealth of teeming lore and scenic beauty within a few hours' drive inland. So all in all, we may toast Alexandria, home town of Washington, just as honestly and heartily as we revere his memory and his exploits. For both are worth it.

Someone had wired a government bureau asking whether hydrochloric acid could be used to clean a given type of boiler tube. The answer was: "Uncertainties of reactive processes make use of hydrochloric acid undesirable where alkalinity is involved."

The inquirer wrote back, thanking the bureau for the advice, saying that he would use hydrochloric acid. The bureau wired him: "Regrettable decision involves uncertainties. Hydrochloric will produce submuriate invalidating reactions."

Again the man wrote thanking them for their advice, saying that he was glad to know that hydrochloric acid was all right. This time the bureau wired in plain English:

"Hydrochloric acid," said the telegram, "will eat hell out of your tube."

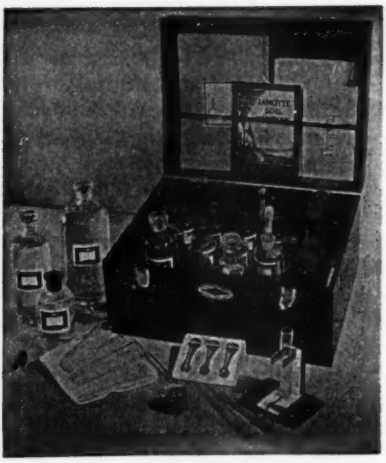
Time Proven LaMotte Soil Testing Apparatus

LaMotte Soil Testing Service is the direct result of 26 years of extensive cooperative research with agronomists and expert soil technologists to provide simplified soil testing methods. These methods are based on fundamentally sound chemical reactions adapted to the study of soils, and have proved to be invaluable aids in diagnosing deficiencies in plant food constituents. These methods are flexible and are capable of application to all types of soil with proper interpretation to compensate for any special soil conditions encountered.

Methods for the following are available in single units or in combination sets:

Ammonia Nitrogen	Iron
Nitrate Nitrogen	pH (acidity & alkalinity)
Nitrite Nitrogen	
Available Potash	Manganeses
Available Phosphorus	Magnesium
Chlorides	Aluminum
Sulfates	Replaceable Calcium

Tests for Organic Matter and Nutrient Solutions (hydroculture) furnished only as separate units.



LaMotte Combination Soil Testing Outfit

Standard model for pH, Nitrate, Phosphorus and Potash. Complete with instructions, $35.00 f.o.b. Towson, Maryland.

Illustrated literature will be sent upon request without obligation.

LaMotte Chemical Products Co.

Dept. BC Towson 4, Md.

AVAILABLE LITERATURE

The following literature on the use of fertilizers in profitable soil and crop management is available for distribution. We shall be glad to send these upon request and in reasonable amounts as long as our supply lasts.

Circulars

Tomatoes (General)
Asparagus (General)
Vine Crops (General)
Sweet Potatoes (General)
Better Corn (Midwest) and (Northeast)

Reprints

N-9 Problems of Feeding Cigarleaf Tobacco
F-3-40 When Fertilizing, Consider Plant-food Content of Crops
S-3-40 What Is the Matter with Your Soil?
11-12-42 Wartime Contribution of the American Potash Industry
H-2-43 Plant Food for Peach Profits
J-2-43 Maintaining Fertility When Growing Peanuts
Y-5-43 Value & Limitations of Methods of Diagnosing Plant Nutrient Needs
FF-8-43 Potash for Citrus Crops in California
A-1-44 What's in That Fertilizer Bag?
H-2-44 Efficient Fertilizers for Potato Farms
AA-8-44 Florida Knows How to Fertilize Citrus
CC-8-44 Soil Fertility's Effect on Asparagus
QQ-12-44 Leaf Analysis—A Guide to Better Crops
P-3-45 Balanced Fertility in the Orchard
R-3-45 Higher Corn Yields for North Carolina
Z-5-45 Alfalfa—the Aristocrat
DD-5-45 A Case of Combined Potassium and Boron Deficiencies in Grapes
FF-6-45 Orcharding from the Ground Up
GG-6-45 Know Your Soil
LL-8-45 Fertilizing for Better Soybeans in North Carolina
MM-8-45 Red Clover Suggests Shortage of Potash
OO-8-45 Potash Fertilizers Are Needed on Many Midwestern Farms
PP-10-45 More Vegetables for Less Money
QQ-10-45 A Little Boron Boosts Sweet Potato Yields
SS-10-45 How to Start White Dutch Clover Pastures in Florida
TT-10-45 Kudzu Responds to Potash
YY-11-45 Potash—In War and Peace
ZZ-11-45 First Things First in Soil Fertility
BBB-12-45 Success with Blueberries
CCC-12-45 Poor Soils—Poor People
A-1-46 Crop Production Horizons
B-1-46 Potash Increases Tomato Yield and Quality
D-1-46 A New Legume for the South—Wild Winter Peas
E-1-46 The Sources of Potash for Flue-cured Tobacco
H-2-46 Plow-sole Placed Plant Food for Better Crop Production
J-2-46 Correcting Potash Deficiency in Growing Corn
N-3-46 Sweet Potatoes Are Proving New Gold for the South
O-3-46 Fertilizer Placement for Corn in Kentucky
P-3-46 The Story of Potash
Q-4-46 Potash Treatment Makes Better Sweet Clover
R-4-46 Alfalfa in Mississippi Decreased as Soil Fertility Declined
S-4-46 Plow-under Fertilizer Ups Corn Yields
T-4-46 Potash Losses on the Dairy Farm
W-4-46 Muck Soils Produce Quality Sweet Corn for Canning
X-4-46 Potash Pays Good Dividends in Louisiana
Y-5-46 Learn Hunger Signs of Crops
Z-5-46 I Saw It Happen in the Soil-testing Laboratory
AA-5-46 Efficient Fertilizers Needed for Profit in Cotton
BB-5-46 The Soil Is Our Heritage
CC-5-46 Corn Production in Mississippi
EE-6-46 Dynamic Sassafras Soils
FF-6-46 The Newest Potato Pest—Golden Nematode
GG-6-46 A Machine for Deep Fertilizer Placement
HH-6-46 Mistakes Versus Essentials of Pond Management for Fish
II-6-46 Pastures in Mississippi Produce Profits
KK-8-46 South Mississippi Soils Produce Fine Pastures and Livestock When Minerals Are Applied
LL-8-46 Trends in the Use of Major Plant Foods
MM-8-46 For Farms and Game Preserves—Bicolor Lespedeza
NN-10-46 Soil Testing—A Practical Aid to the Grower & Industry
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PP-10-46 The Burtons Farm to Feed People
QQ-10-46 Tip-burn-like Condition in Greenhouse Lettuce Corrected by Borax
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CCC-12-46 Hugh Bennett's Homecoming

THE AMERICAN POTASH INSTITUTE

1155 16TH STREET, N. W. **WASHINGTON 6, D. C.**

A Negro, riding home on his mule, passed under an apple tree, so he stopped and reached up for a tasty apple on a high branch. Just as he did so, the mule started off, leaving Mose hanging perilously. Just then the owner of the orchard came along.

"What are you doing up there?" he demanded.

"Befo' de Lawd," said Mose, "Ah jes' fell off mah mule!"

* * *

A very small boy came home dejectedly from his first day at school. "Ain't goin' tomorra," he muttered. "And why not?" his mother asked. "Well, I can't read and I can't write and they won't let me talk, so what's the use."

* * *

Lecturer—"Of course you all know what the inside of a corpuscle looks like."

Chairman—"Most of us do, but you'd better explain for those that haven't been inside one."

* * *

He: "Do you know that I am something of a mindreader?"

She: "So? Well, why are you sitting at the other end of the davenport?"

* * *

Sailor (getting in barber chair)—"Cut all three short."

Barber—"Which three?"

Sailor—"Whiskers, hair, and chatter."

Visitor: "What a charming baby, and how it does resemble your husband."

Hostess: "Gracious, you alarm me; we adopted the baby."

* * *

A businesswoman entertaining some businessmen at luncheon in a French restaurant, and not wishing to be obvious about paying the check, whispered to her waiter when the meal was over, *"L'addition, s'il vous plait."*

"Downstairs to your left, lady," he replied.

* * *

The sergeant was taking particulars from a new recruit.

"Are you married?"

"Yes, sir."

"Any children?"

"Yes, sir. Five girls and four boys."

"Nine altogether."

"No, sir. One at a time!"

* * *

Mabel: "So he says to me, 'You are very laconic.' "

Maybelle: "Gee, what does that mean?"

Mabel: "I dunno. But I give him one in the nose to be on the safe side!"

* * *

COULDN'T GIVE HER AWAY

Two Irishmen, one accompanied by his wife, met on the street.

Said Pat to Mike, "Let me present me woife to yez."

"No, thanks," replied Mike, "Oi got wan o' me own."

Need for—

BORON IN AGRICULTURE

Authorities have recognized that the depletion of Boron in soil has been reflected in limited production and poor quality of numerous field and fruit crops.

Outstanding results have been obtained with the application of Borax in specific quantities or as part of the regular fertilizer mix, improving the quality and increasing the production of alfalfa and other legumes, table beets, sugar beets, apples, etc.

The work of the State Agricultural Stations and recommendations of the County Agents are steadily increasing the recognition of the need for Boron in agriculture. We are prepared to render every practical assistance.

Borax is economical and very little is required. It is conveniently packed in 100 lb. sacks and stocks are available for prompt delivery everywhere in the United States and Canada. Address your inquiries to the nearest office.

PACIFIC COAST BORAX COMPANY

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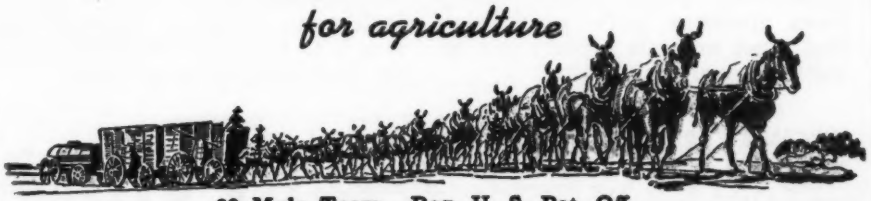
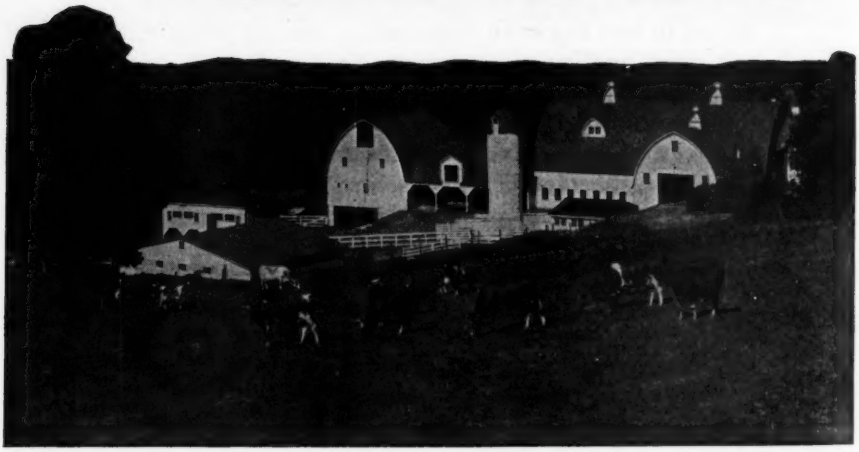
BORAX

for agriculture



20 Mule Team. Reg. U. S. Pat. Off.

PASTURES are CASH CROPS



PASTURES can be made the most profitable land on the livestock farm. Well-managed and properly-fertilized pastures often yield four to five times as much succulent, green, nutritious forage as the same land would yield without fertilizer and good management.

Early and liberal application of pasture fertilizer helps grasses and legumes to make quick, vigorous growth, rich in proteins, minerals, vitamins and other nutrients. Grazing this high-quality, appetizing, green forage, dairy cows increase milk production and meat animals rapidly put on valuable weight.

The abundant use of fertilizer on pastures not only yields more and better grazing, it also furnishes many extra grazing days—spring, summer and fall. By producing extra yields of low-cost, high-quality green feed which animals can harvest, pasture fertilizer saves labor and greatly reduces expensive barn feeding. And the good ground cover of grasses and legumes protects the soil from erosion.

Virginia-Carolina Chemical Corporation has been a leader in the manufacture of better pasture fertilizers, for many years. There is a V-C Fertilizer for every crop on every soil on every farm.

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Make the good earth better!

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NEW CHEMICALS
TO OVERCOME
FUNGI-INSECTS-WEEDS

☑ *Check the pest you want to Control!*

SEED DECAY AND DAMPING-OFF OF PEAS, BEANS, LIMA BEANS AND CORN—Use Spergon seed protectant. It makes reduced planting rate possible with stronger stands, higher yields.

DOWNY MILDEW OF CABBAGE—Use Spergon (Wettable) as a spray or dust. It is widely recommended by leading authorities.

LEAF BLIGHTS AND ANTHRACNOSE OF TOMATOES—Use Phygon (Wettable) as a dust or spray. It gives economical control and increased yields.

SEED DECAY AND DAMPING-OFF OF BEETS, SPINACH, TOMATOES, PEPPERS AND SWISS CHARD—Use Phygon seed protectant. It is outstanding for these crops.

ANTHRACNOSE OF BEANS CAN BE CONTROLLED—Use Phygon as a seed protectant, followed by Phygon (Wettable) as a spray ten days after emergence. Don't lose your bean crop this year now that an effective control is available.

CORN BORER AND THRIPS—Use Syndeet-S-30. This is an oil solution containing 30% DDT for making emulsion type sprays. It has given effective economical control in field applications.

APHIDS, EUROPEAN RED MITES AND CODLING MOTH—Use Syndeet-30. At economical dosages, it gives commercial control of these orchard pests.

APHIDS, COLORADO POTATO BEETLES, LEAF HOPPERS AND FLEA BEETLES ON POTATOES—Use Syndeet-30. It gives control with a labor-saving reduction in the number of sprays required. Syndeet-30 is compatible with Bordeaux mixture.

WEED CONTROL—Use Tufor-40, Tufor-70 and Tufor-E. These three formulations of 2, 4-D meet every weed control problem.

EDIBLE VEGETABLE INSECT CONTROL—Use Syntone—a fortified rotenone emulsion.

These recommendations are made on the basis of authoritative field trials by leading plant pathologists and entomologists.

Write for technical data sheets covering your specific problems.

New Scientific Developments of Agricultural Chemical Division

UNITED STATES RUBBER COMPANY

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THE PLANT SPEAKS

A new four-reel series of 16 mm., sound, color films which may be booked independently or in any combination. They may be used to best advantage when shown at least one day apart and in the following sequence:

THE PLANT SPEAKS THRU DEFICIENCY SYMPTOMS pictures soil depletion, erosion, and deficiency symptoms on plants. (Running time 25 min. on 800-ft. reel.)

THE PLANT SPEAKS, SOIL TESTS TELL US WHY depicts taking soil samples on the farm and the interpretation of soil tests. (Running time 10 min. on 400-ft. reel.)

THE PLANT SPEAKS THRU TISSUE TESTS shows the value of tissue testing and the procedure for testing plant tissues in the field. (Running time 14 min. on 400-ft. reel.)

THE PLANT SPEAKS THRU LEAF ANALYSIS evaluates leaves in plant growth and leaf analysis in determining fertilizer needs. (Running time 18 min. on 800-ft. reel.)

We shall be pleased to loan these films to agricultural colleges, experiment stations, county agents, vocational teachers, responsible farm organizations, and members of the fertilizer trade.

OTHER 16MM. COLOR FILMS AVAILABLE FOR TERRITORIES INDICATED

Potash in Southern Agriculture (South)
In the Clover (Northeast)
Bringing Citrus Quality to Market (West)
Machine Placement of Fertilizer (West)
Ladino Clover Pastures (West)
Potash from Soil to Plant (West)
Potash Deficiency in Grapes and Prunes (West)
New Soils from Old (Midwest)
Potash Production in America (All)
Save That Soil (All)
Borax From Desert to Farm (All)

IMPORTANT

Requests should be made *well in advance* and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible), and period of time of loan.

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